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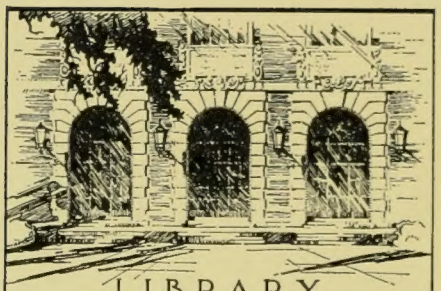

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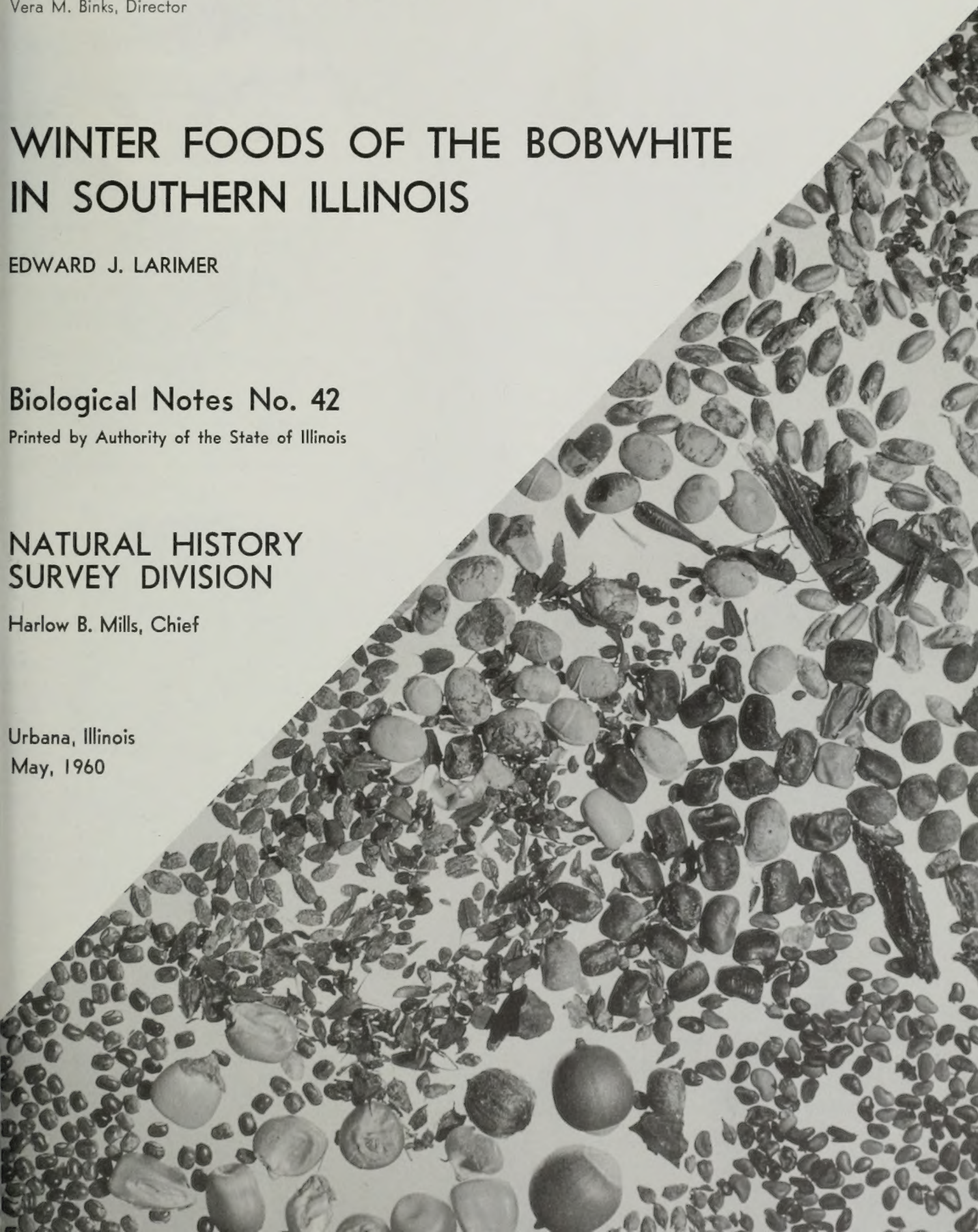

# WINTER FOODS OF THE BOBWHITE IN SOUTHERN ILLINOIS*

Edward J. Larimer†

This is a report on the winter foods of the bobwhite quail *(Colinus virginianus)* in southern Illinois. The investigation on which it is based constitutes one phase of the co-operative research program of the Illinois Natural History Survey and Southern Illinois University.

Data were obtained by inspection of 4,606 crops from bobwhites that were collected during the hunting seasons (November 11-December 11) of 1950 and 1951. Primary consideration was given to determining the kinds of food eaten, to measuring the volume of each food, and to calculating the frequency of occurrence of each (frequency expressed as a percentage of total number of crops collected). An attempt was made to evaluate the effect of weather on the diet and to determine whether any trends in the diet were evident during the short period of time represented.

## ACKNOWLEDGMENTS

Many people aided in this study; to each I am indebted. Dr. Willard D. Klimstra, Director of the Cooperative Wildlife Research Laboratory and Professor of Zoology at Southern Illinois University, Carbondale, gave direct supervision and ready assistance. Dr. Thomas G. Scott, Game Specialist and Head, Section of Wildlife Research, Illinois Natural History Survey, aided and encouraged the study in many ways. Mrs. Diana R. Braverman edited the manuscript. The staff of the Illinois Natural History Survey assisted with insect identification. Dr. Alexander C. Martin, U. S. Fish and Wildlife Service, identified several plant and animal food items. John Oberheu, John Stallings, William Biegler, Walter Stieglitz, John Dennis, Mrs. Elizabeth Leighty, and other members of the Cooperative Wildlife Research Laboratory, Southern Illinois University, gave valuable technical assistance. The Southern Illinois University Statistical Service simplified the computation and tabulation of the data. Many sportsmen contributed bobwhite crops. I am grateful to them as well as to the persons named above.

Mr. A. E. Staley of Decatur, Illinois, contributed funds to support this investigation, and Mr. Max McGraw of Chicago, Illinois, assisted by arranging a grant from the North American Wildlife Foundation. I gratefully acknowledge the support of these men in making possible the completion of this study.

## DESCRIPTION OF THE STUDY AREA

The area, fig. 1, within which the investigation was conducted includes the 34 southernmost counties of Illinois. Irregular in shape, the area extends 160 miles north to south and 150 miles east to west and covers approximately 15,000 square miles. Almost a third of the study area lies below the 38th parallel, which is south of Louisville, Kentucky, and all of the area is farther south than northernmost Virginia.

This area was chosen because it included the major portion of the bobwhite population in Illinois and represented that part of the state which held the greatest potential for bobwhite management. Marquardt & Scott (1952:4-5) reported that 62 per cent of the bobwhites bagged in Illinois in 1950 were from the region covered by the study area; of the 29 counties reporting the "best" kills of bobwhites, 24 were among those included in this study.

The continental location and latitude of the area result in considerable climatic variation. Mean January temperatures range from 28 degrees F. in the northern part of the study area to about 34 degrees F. in the southern part; during July most of this region has a mean temperature of 78 degrees F. Summer temperatures of 100 degrees F. are not infrequent, and winter temperatures as low as -20 degrees F. are occasionally recorded. In the southern part of the study area the growing season is over 200 days long, sufficient to grow crops such as cotton; at the northern border the growing season is about 180 days long. The average annual precipitation varies from 38 to over 46 inches, being lower in the north than in the south. March is the wettest month. For most of the area, 50 to 60 per cent of the annual rainfall occurs during the growing season; how-

*Project No. 1: Cooperative Wildlife Research Laboratory, Southern Illinois University and the Illinois Natural History Survey, co-operating.

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ever, the extreme southern tip receives less than 50 per cent during the growing season. The average annual snowfall ranges from 9.9 inches in the south to 18.6 inches in the north, but snow normally remains on the

Fig. 1.—Counties in southern Illinois (indicated by dotted pattern) in which bobwhite crops were collected from hunters for the investigation reported in this publication.

ground for only a short time. The above data, compiled from long-record weather stations in Illinois, were taken from Page (1949).

The study area embraces a zone of transition for floral, faunal, physiographic, and edaphic provinces. In biotic communities, farming practices, and cultural mores, a fusion of the North and the South is evident.

The Western Mesophytic Forest and the Oak-Hickory Forest regions are found here (Braun 1950). The Oak-Hickory Forest is extensively interspersed with prairie, whereas the Western Mesophytic Forest is marked by hilly terrain with mixed mesophytic communities. King & Winters (1952:3, 22) estimated that 39 per cent of Illinois had originally been forested, whereas 11 per cent was forested in 1948. The greater part of the present forested area of the state is in the study area, particularly in the 11 southernmost counties where, in 1948, 18 per cent of the total land in some counties to over 40 per cent in others was timbered (King & Winters 1952:21).

Four major soil associations occur in southern Illinois (U. S. Department of Agriculture 1938:1056-7, 1067, 1104, 1134; and map accompanying). These range from extensive alluvial deposits along the Ohio and Mississippi rivers to mature upland soils. Soil fertility is generally low, but the land responds well to careful cultivation and sound conservation practices. Four major physiographic provinces are represented (Leighton, Ekblaw, & Horberg 1948), ranging from rugged hills in the south to gentle plains in the north. Approximately four-fifths of the area was glaciated.

Four farming-type areas occur in southern Illinois (Ross & Case 1956:32): general farming and dairy, general farming, grain and livestock, and general farming and fruit. There is no sharp distinction between the farming-type areas; land use varies considerably even within each of these areas (Ross & Case 1956:51-62).

The acreage in corn ranges from 20 per cent of the land in some counties to 31 per cent in others, soybeans from 9 to 16 per cent, wheat from 4 to 20 per cent, pasture from 23 to 43 per cent, hay from 5 to 9 per cent, and idle land from 6 to 11 per cent. The largest corn acreages are in regions influenced by extensive river bottoms. The acreage planted to soybeans has increased in recent years. Most of the wheat is in the central part of the area.

## METHODS OF ANALYSIS

The average volume per unit—such as a seed or an insect—was found for each kind of food by determining the volume of a large number of units of that food and dividing this total volume by the number of units.

In all but a few cases, volume was determined by the displacement method. The volume of very small seeds could not be determined without a displacement medium. Lead shot and sand as displacement media proved unsatisfactory. Water was a suitable displacement medium for the determination of the average unit volume of most seeds and insects. Objects that floated were forced below the surface with a small screen of known volume. Certain seeds and all soft-bodied animals such as slugs and larvae were measured in their natural

state in order to eliminate error introduced by the shrinkage that occurs during storage in the laboratory; when thoroughly dried, foods of this type often shrink to but a small fraction of their original volume.

Accuracy in determining the average unit volume for each kind of food depended upon measuring a large number of specimens. If the bobwhite crops did not yield enough specimens of any food to permit reliable measurements to be made, additional specimens of the same food were taken from the reference collection used in food habits studies at Southern Illinois University, or, if neither source yielded an adequate number of specimens, an estimate of average unit volume was obtained by comparison with foods of known volume.

In most cases the total volume of a specific food in a crop was calculated by multiplying the number of units of that food by the average unit volume determined for it. When fragments of a food unit occurred in a single

Table 1. — Number of hunters contacted, number of hunters who contributed bobwhite crops, and number of crops collected from 34 southern Illinois counties during two hunting seasons, November 11 - December 11, 1950 and 1951.*

| County | 1950 | | | 1951 | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|
| | Hunters Contacted | Hunters Contributing | Bobwhite Crops | Hunters Contacted | Hunters Contributing | Bobwhite Crops | Hunters Contacted | Hunters Contributing | Bobwhite Crops |
| Alexander | 5 | 3 | 63 | 4 | 1 | 0 | 9 | 4 | 63 |
| Bond | 1 | 0 | 9 | 2 | 1 | 66 | 3 | 1 | 75 |
| Clay | 5 | 3 | 61 | 5 | 2 | 23 | 10 | 5 | 84 |
| Clinton | 5 | 2 | 66 | 2 | 0 | 0 | 7 | 2 | 66 |
| Crawford | 4 | 1 | 21 | 6 | 2 | 23 | 10 | 3 | 44 |
| Edwards | 3 | 3 | 69 | 5 | 3 | 74 | 8 | 6 | 143 |
| Effingham | 4 | 2 | 48 | 6 | 3 | 49 | 10 | 5 | 97 |
| Fayette | 3 | 2 | 62 | 5 | 3 | 31 | 8 | 5 | 93 |
| Franklin | 5 | 3 | 57 | 8 | 6 | 176 | 13 | 9 | 233 |
| Gallatin | 5 | 3 | 75 | 3 | 1 | 11 | 8 | 4 | 86 |
| Hamilton | 4 | 2 | 75 | 4 | 2 | 65 | 8 | 4 | 140 |
| Hardin | 5 | 3 | 50 | 4 | 3 | 39 | 9 | 6 | 89 |
| Jackson | 9 | 7 | 60 | 8 | 7 | 126 | 17 | 14 | 186 |
| Jasper | 4 | 2 | 62 | 2 | 2 | 14 | 6 | 4 | 76 |
| Jefferson | 5 | 3 | 81 | 6 | 6 | 173 | 11 | 9 | 254 |
| Johnson | 3 | 2 | 79 | 2 | 2 | 99 | 5 | 4 | 178 |
| Lawrence | 3 | 2 | 20 | 3 | 3 | 36 | 6 | 5 | 56 |
| Madison | 3 | 1 | 33 | 3 | 0 | 0 | 6 | 1 | 33 |
| Marion | 3 | 2 | 140 | 5 | 5 | 225 | 8 | 7 | 365 |
| Massac | 5 | 3 | 18 | 4 | 3 | 19 | 9 | 6 | 37 |
| Monroe | 6 | 5 | 131 | 4 | 1 | 15 | 10 | 6 | 146 |
| Perry | 6 | 4 | 122 | 4 | 3 | 80 | 10 | 7 | 202 |
| Pope | 5 | 1 | 59 | 3 | 1 | 5 | 8 | 2 | 64 |
| Pulaski | 6 | 2 | 111 | 5 | 3 | 93 | 11 | 5 | 204 |
| Randolph | 6 | 4 | 117 | 6 | 4 | 86 | 12 | 8 | 203 |
| Richland | 5 | 4 | 62 | 4 | 1 | 32 | 9 | 5 | 94 |
| Saline | 5 | 3 | 15 | 3 | 2 | 4 | 8 | 5 | 19 |
| St. Clair | 5 | 3 | 99 | 5 | 2 | 69 | 10 | 5 | 168 |
| Union | 5 | 3 | 53 | 6 | 2 | 48 | 11 | 5 | 101 |
| Wabash | 5 | 1 | 26 | 3 | 2 | 42 | 8 | 3 | 68 |
| Washington | 5 | 4 | 154 | 1 | 1 | 10 | 6 | 5 | 164 |
| Wayne | 5 | 3 | 127 | 5 | 1 | 63 | 10 | 4 | 190 |
| White | 5 | 5 | 176 | 4 | 4 | 196 | 9 | 9 | 372 |
| Williamson | 6 | 5 | 99 | 6 | 5 | 64 | 12 | 10 | 163 |
| County undetermined | — | — | 34 | — | — | 16 | — | — | 50 |
| *Total* | *159* | *96* | *2, 534* | *146* | *87* | *2, 072* | *305* | *183* | *4, 606* |

*The numbers of hunters who were contacted and who contributed bobwhite crops are tabulated according to the counties in which they resided. Each crop is tabulated according to the county in which the bobwhite was killed. The contributing hunters did not necessarily hunt in their home counties.

crop, as was frequently the case with acorns, the total volume of complete and fragmentary units was measured by displacement.

For each food, one or more whole or partial units of that food in a crop constituted an "occurrence." Frequency of occurrence for any food was expressed as percentage and was derived by dividing the number of crops in which the food was found by the total number of crops examined (including those that contained no food). The percentage of the total crop contents constituted by any food was determined by dividing the total volume of the food by the total volume of the contents of all crops. In order to facilitate analysis of the data, they were placed on approximately 20,000 International Business Machine cards.

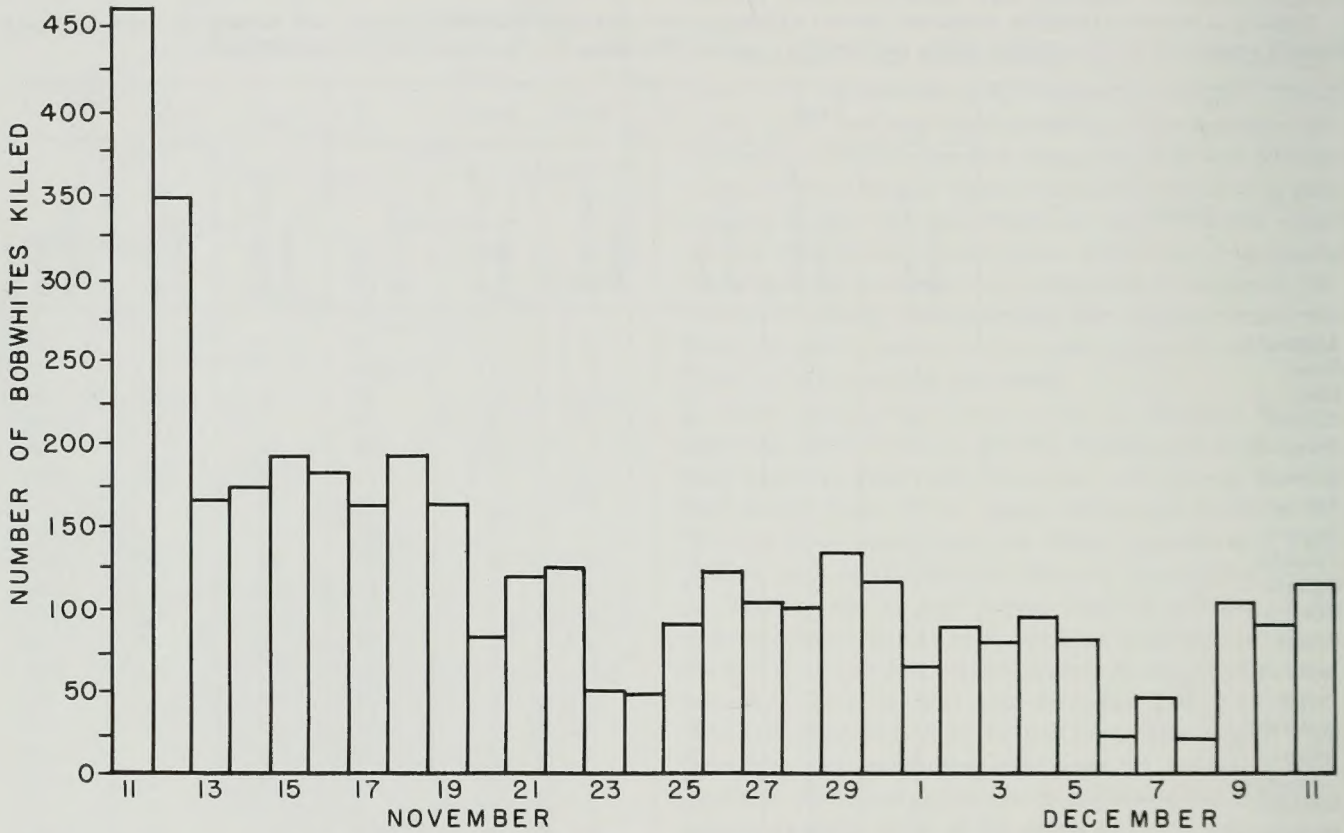



Fig. 2. — The number of bobwhites killed on each day of the hunting seasons of 1950 and 1951 combined. The date of kill was known for 3,925 of the 4,606 bobwhites represented in this study.

## RESULTS OF INVESTIGATION

Contents of the crops of 4,606 bobwhites were analyzed; of these, 2,534 were collected in 1950 and 2,072 in 1951 during the Illinois hunting season, which extended from noon of November 11 through December 11, table 1. Food was found in 4,171 of the crops, 2,326 in 1950 and 1,845 in 1951.

Ninety-six hunters contributed crops in 1950 and 87 in 1951; 60.4 per cent of the hunters contacted contributed crops in 1950 and 59.6 per cent in 1951. The average number of crops per contributor was 26.4 in 1950 and 23.8 in 1951. Contributions by individual hunters for a single season ranged from 2 to 179 crops. Crops were collected in each of the 34 counties involved in this study.

The date of kill was available for 3,925 of the 4,606 bobwhites collected, fig. 2. Each year a greater kill was made on the opening day of the hunting season than on any other day, despite the fact that the season did not open until noon. In the 2 years combined, over 11 per cent of the bobwhites for which the kill dates were known were killed on the opening days. Fifty-four per cent of the total kill was accomplished during the first 10 days of the seasons and 19 per cent during the last 10 days. Approximately 25 per cent of the birds were taken during the first 3 days of the hunting seasons. The number of bobwhites killed per day was only a little greater on the week ends than it was on the weekdays.

### Major Food Groups

Foods identified as plant made up 93.94 per cent of the total volume of the crop contents of the bobwhites

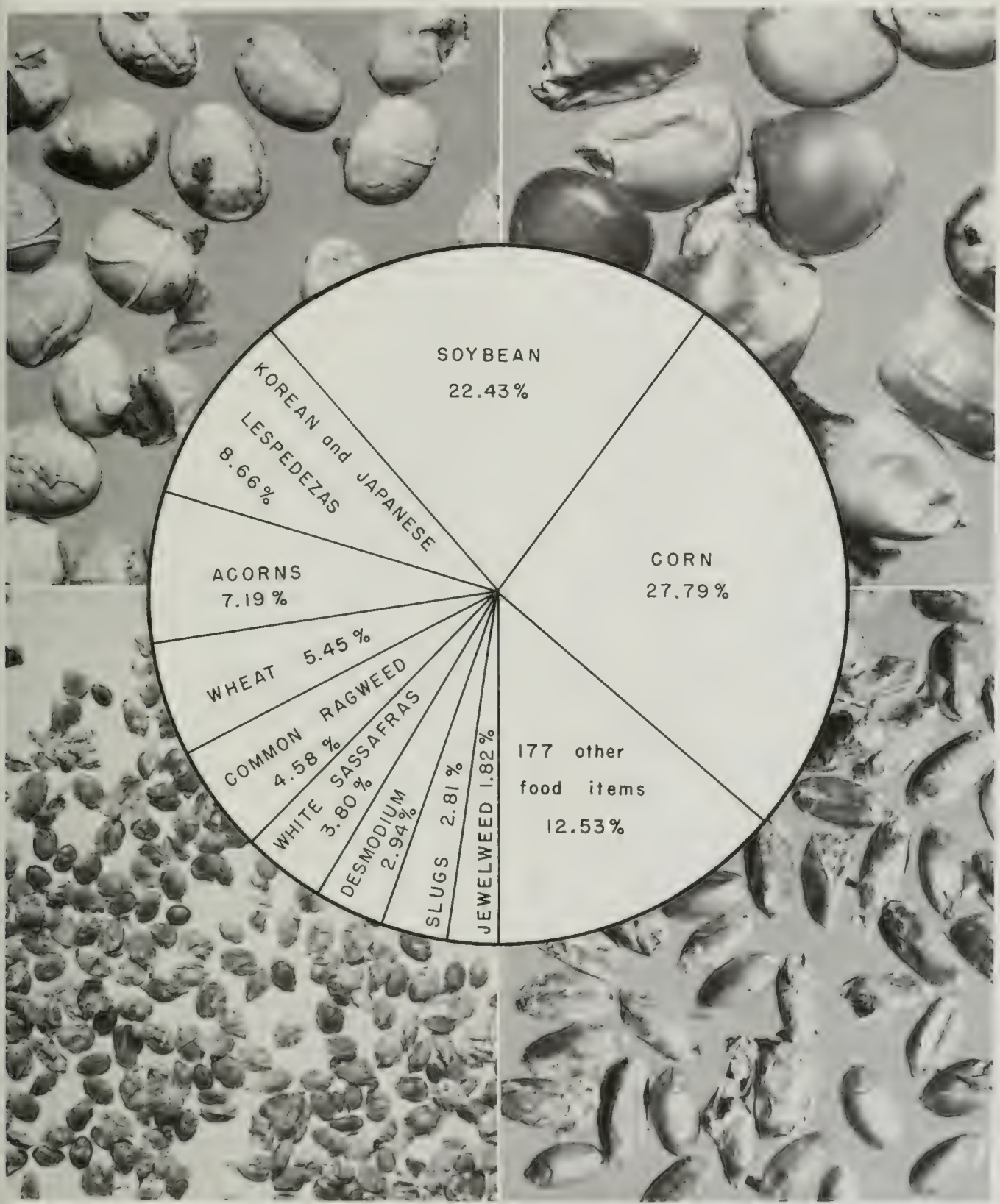



Fig. 3.—Percentage of total food volume made up by each of the 10 most important food items in the bobwhite diet in 34 counties in southern Illinois. The figures are based on crop collections made during the hunting seasons of 1950 and 1951 combined.

collected in 1950 and 1951 combined, table A, Appendix. Foods identified as animal totaled 6.03 per cent and grit made up 0.02 per cent. In addition to material identified as plant or animal was organic material of undetermined origin amounting to 0.01 per cent of the total contents.

A comparison of the dietary pattern for 1950 with that for 1951 revealed some differences in the percentages of food identified as plant or animal. In 1950 the plant materials constituted 95.22 per cent and the animal materials constituted 4.75 per cent of the total volume. In 1951 the plant materials totaled 92.21 per cent and the animal materials 7.77 per cent.

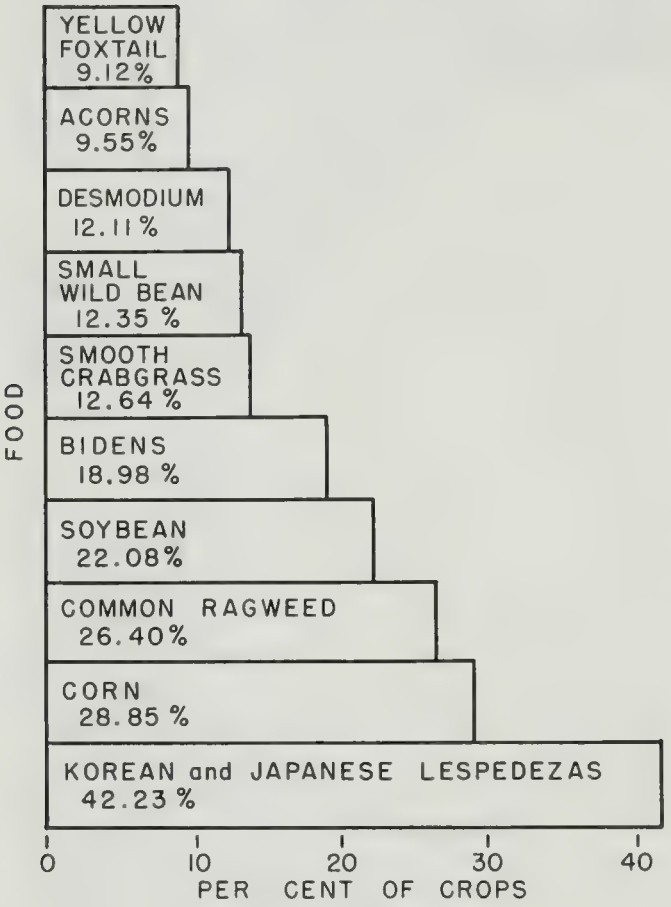



Fig. 4.—Frequency of occurrence (in per cent) of the 10 foods which were found in the greatest number of bobwhite crops in southern Illinois in the hunting seasons of 1950 and 1951 combined.

Each of six families of plants formed 1 per cent or more of the volume of plant food and the six together totaled 97.58 per cent of the plant food in the years 1950 and 1951 combined, table B, Appendix (scientific names of food plants are included in this table). Legumes made up 39.22 per cent of the plant food volume; representatives occurred 4,507 times (the total of all occurrences of each food identified as a member of the legume family). Soybean, Korean and Japanese lespedezas, desmodium, cowpea, and small wild bean were the most common legumes. Korean and Japanese lespedezas were represented in almost as many crops as all the other members of the family combined. In this study Korean and Japanese lespedezas were grouped as one food because of the difficulty in distinguishing between the two species when the husks were missing or when the seeds were immature.

Grasses comprised 37.83 per cent of the plant foods, with representatives appearing 3,743 times. Corn, wheat, yellow foxtail, and smooth crabgrass were represented in appreciable amounts. The number of species of grasses represented exceeded that of any other family, but most of the grasses did not occur in large quantities.

The beech family ranked third by volume. Oaks (acorns), the only representatives of this family, formed 7.65 per cent of the plant food volume and occurred 440 times.

Members of the composite family accounted for 6.91 per cent of the plant food volume and representatives occurred 2,323 times. Three composites—common ragweed, bidens, and lance-leaved ragweed—were present in significant quantities.

The laurel family ranked fifth in volumetric order. White sassafras, the only laurel represented, formed 4.04 per cent of the plant food volume and occurred 241 times in the crops collected.

One other family, touch-me-not, formed nearly 2 per cent of the total plant food volume. Jewelweed, the only member represented, comprised 1.93 per cent of the plant food volume and occurred 399 times. Three other families—cashew, spurge, and sour gum—accounted for 0.52, 0.51, and 0.47 per cent by volume respectively of the plant foods.

Two animal classes, Gastropoda and Insecta, each made up 1 per cent or more of the volume of the bobwhite diet. The Gastropoda (snails, slugs, limpets, and whelks) formed 48.64 per cent of the animal food and occurred 364 times, table C, Appendix. Of the slugs the Philomycidae occurred most often. Insects comprised 44.56 per cent of the animal food volume, with representatives appearing 1,527 times. The order Orthoptera (grasshoppers, cockroaches, and crickets) accounted for approximately one-half of the insect volume but occurred only about one-sixth as often as all other insect items combined. Three other classes, Arachnoidea (scorpions, harvestmen, spiders, and mites), Chilopoda (centipedes), and Diplopoda (millipedes), were of little consequence in terms of volume.

### Food Items

The foods found in the crops for both years were listed under 187 separate designations, table D, Appen-

dix. On the basis of volume or frequency of occurrence only a few of these were of importance in the diet; the first 10 foods by volume are presented in fig. 3 and by frequency of occurrence in fig. 4. Only 12 plant and 2 animal foods individually comprised 1 per cent or more of the total volume, fig. 5; together, they formed 92.53 per cent of the crop contents in both years combined. A few foods accounted for most of the volume. Corn and soybean, ranking first and second, together made up 50.22 per cent of the total volume. These and the next highest ranking foods – Korean and Japanese lespedezas, acorns, and wheat – made up 71.52 per cent of the volume.

Variations in relative volume from one year to the next were noted. In 1950, 14 foods and, in 1951, 12 foods individually accounted for 1 per cent or more of the volume. Corn, soybean, Korean and Japanese lespedezas, acorns, wheat, common ragweed, slugs, jewelweed, bidens, and short-horned grasshoppers were among these foods in both years. Cowpea, small wild bean, yellow foxtail, and smooth crabgrass formed more than 1 per cent of the volume in 1950 but smaller percentages in 1951. White sassafras and desmodium constituted 1 per cent or more of the volume in 1951 only. Corn and soybean ranked first and second by volume both in 1950 and in 1951.

Korean and Japanese lespedezas, corn, and common ragweed ranked in that order in frequency of occurrence both in 1950 and in 1951. Soybean, bidens, and small wild bean were each found in more than 10 per cent of the crops in both years. Smooth crabgrass, yellow foxtail, and witch grass each occurred in more than 10 per cent of the crops in 1950 only; desmodium, acorns, and white sassafras in 1951 only.

Soybean comprised 29.05 per cent of the total volume in 1950 but only 13.47 per cent in 1951. The frequency of occurrence of soybean fell from 26.20 per cent in 1950 to 17.04 per cent the following year. Other important foods which showed marked variations in relative volume in the two years were white sassafras, wheat, cowpea, acorns, desmodium, and bidens. Corn, Korean and Japanese lespedezas, common ragweed, slugs, jewelweed, short-horned grasshoppers, and small wild bean showed little quantitative change from 1950 to 1951.

Some of the foods taken in small quantities also exhibited comparatively marked variations in amounts taken in 1950 and in 1951. Black gum was particularly notable in that it constituted 0.77 per cent by volume of the crop contents and appeared in 0.59 per cent of the crops in 1950 but did not appear in 1951.

Food items forming 1 per cent or more of the total volume for 1950 and 1951 combined, table D, Appendix, are herewith discussed in some detail. They are presented in descending order of rank by per cent of volume of total crop contents.

**1. Corn,** found in greater quantity than any other food, constituted 27.79 per cent of the total crop contents. It was present in 28.85 per cent of the southern Illinois bobwhite crops examined, ranking second in frequency of occurrence. The amount of this food reflects, among other things, its agricultural importance and general availability in southern Illinois. In the diet of certain Indiana bobwhites, corn was first by volume (27.4 per cent) and occurred in 29.1 per cent of the crops (Reeves 1954:43). It was the most important winter food of bobwhites studied in eastern Nebraska (Damon 1949: 25). In a Missouri study (Korschgen 1948:52), it ranked second by volume (16.8 per cent) and occurred in 22.2 per cent of the crops.

**2. Soybean** made up 22.43 per cent of the total crop contents and ranked fourth in frequency of occurrence; it was found in 22.08 per cent of the Illinois crops examined. As in the case of corn, the importance of soybean in the food of southern Illinois bobwhites probably reflects its agricultural importance and general availability in the study area. This legume was not found in large proportions in other studies of bobwhite foods. In Indiana, Reeves (1954:43) found that soybean made up 4.0 per cent of the volume, ranking fifth. For Missouri, Korschgen (1948:52) reported that soybean ranked seventh (2.6 per cent) by volume. Baldwin & Handley (1946: 145) ranked it third by volume (7.6 per cent) in Virginia. Cady (1944:12) found that soybean and cowpea together held fourth place by percentage of total weight (3.57 per cent) in the Tennessee area he studied.

**3. Korean and Japanese lespedezas** were third by volume (8.66 per cent of crop contents) but first in frequency of occurrence (42.23 per cent) in southern Illinois. In the cases in which each could be specifically designated, Korean lespedeza comprised approximately 90 per cent of the total volume of the two species and occurred approximately three times as often as Japanese lespedeza. Compared to the corn and soybean acreage, the yearly acreage planted in Korean and Japanese lespedezas within the study area was small. However, the persistence of these lespedezas and their ability to spread undoubtedly made them widely available. Many other studies have shown these lespedezas to be important as food for bobwhites. In a Missouri study in which the species were listed separately, Korean lespedeza ranked first by volume (17.4 per cent) and first in frequency of occurrence (44.8 per cent), while Japanese lespedeza made up 1.1 per cent of the volume and occurred in 14.0 per cent of the crops (Korschgen 1948:52). In an Indiana investigation (Reeves 1954:43), Korean lespedeza was third by volume (15.7 per cent) and first in frequency of occurrence (55.8 per cent). In a report from Virginia (Baldwin & Handley 1946:145), Japanese lespedeza ranked second by volume (9.7 per cent). A

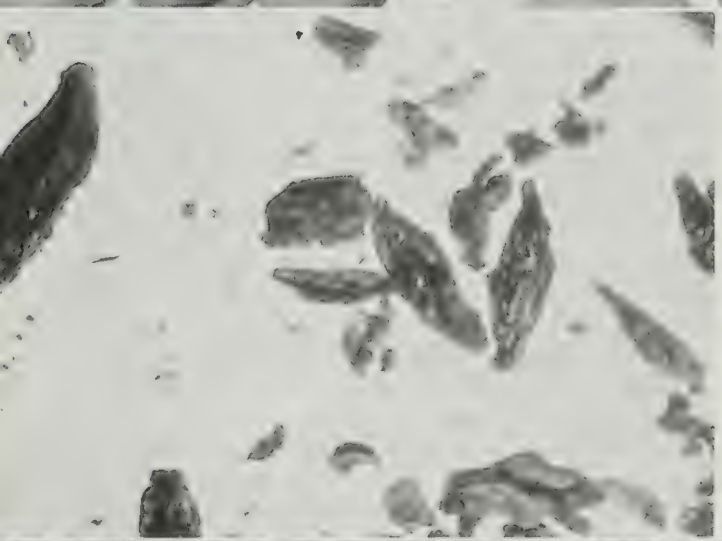
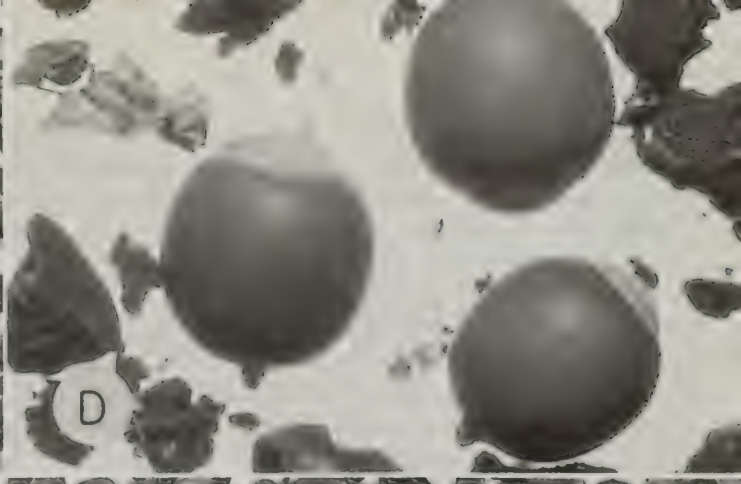
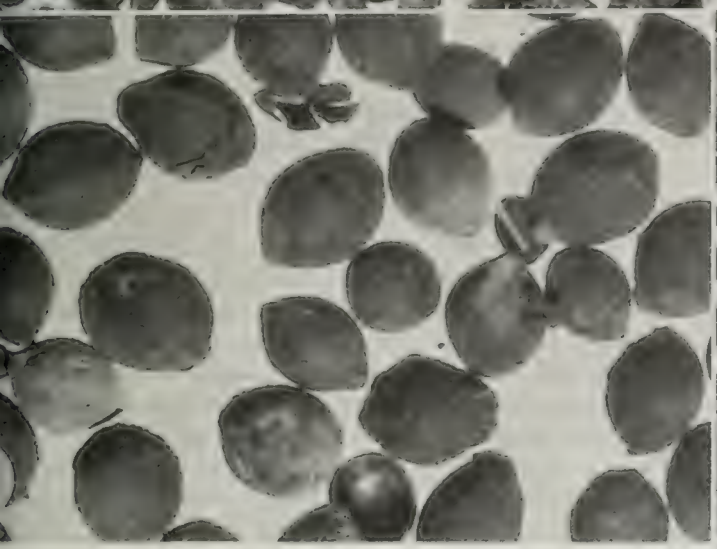
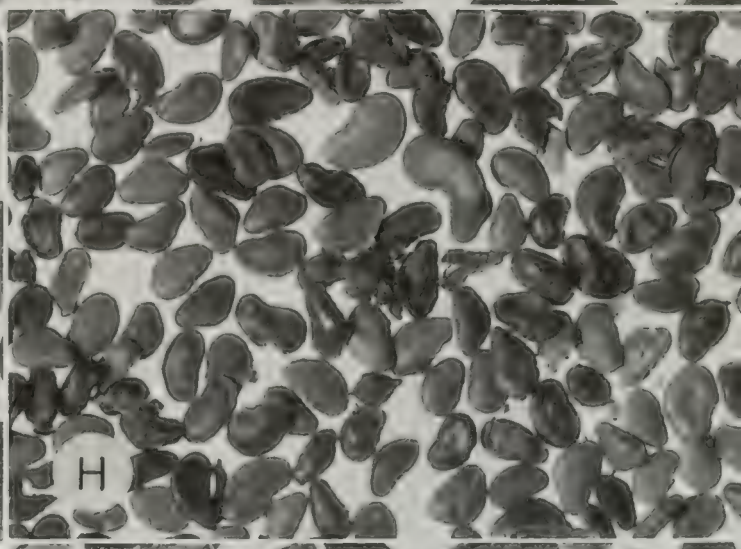


Fig. 5—Major winter foods of the bobwhite in southern Illinois. These 12 plant and 2 animal foods individually

A.—Corn
B.—Soybean
C.—Korean and Japanese Lespedezas
D.—Oak (Acorns)
E.—Wheat
F.—Common Ragweed
G.—White Sassafras

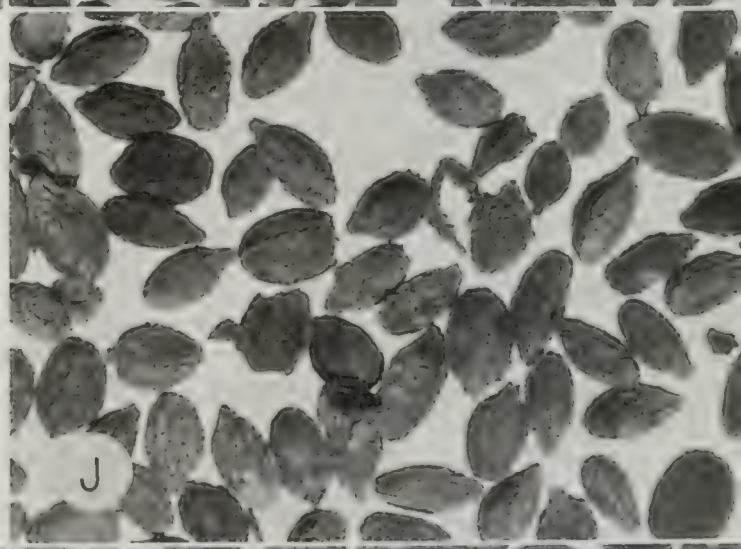


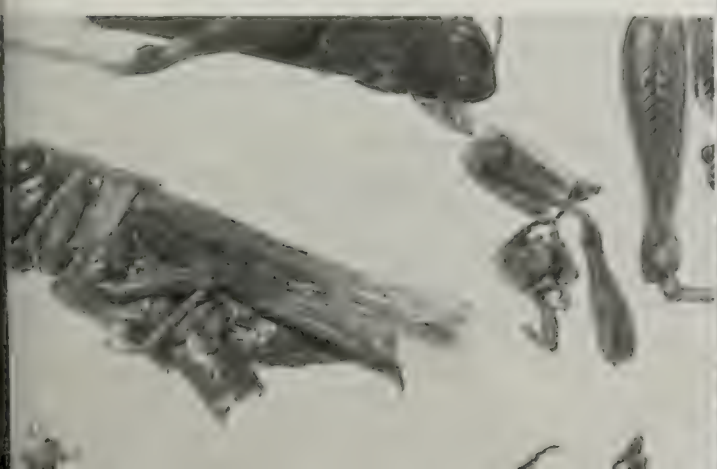



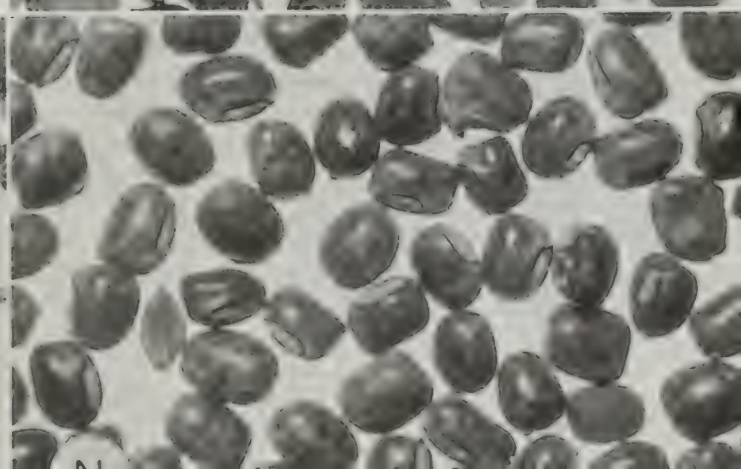



comprised 1 per cent or more of the total crop contents in 1950 and 1951 combined.

H. – Desmodium
I. – Slugs
J. – Jewelweed
K. – Bidens
L. – Cowpea
M. – Short-Horned Grasshoppers
N. – Small Wild Bean





study on abandoned farm land in Tennessee (Cady 1944) revealed that these lespedezas formed a substantial proportion of the bobwhite food, 62.38 per cent of the total food by weight.

**4. Oak (acorns)** constituted 7.19 per cent of the crop contents and ranked ninth in frequency of occurrence (9.55 per cent) in southern Illinois bobwhites. Few whole acorns were found in the crops; most of this food had evidently been taken by the bobwhites in the form of fragments remaining from the feeding activities of other animals.

Acorns are found throughout most of the range of bobwhites and are a staple food in most places. They were found to be the most common food in the diet of Alabama bobwhites studied by Allen & Pearson (1945*a*:9, 1945*b*:9), forming over 20 per cent of the food volume. They ranked fifth by volume (6.6 per cent) in a Missouri study (Korschgen 1948:52) and ninth (1.4 per cent) in an Indiana study (Reeves 1954:44).

**5. Wheat** made up 5.45 per cent of the crop contents and occurred in 4.54 per cent of the crops in the present study. When wheat occurred in a crop it generally formed the major portion of the contents, possibly reflecting its tendency to be locally available. Wheat ranked fifth by volume in this study, sixth in a Virginia study (Baldwin & Handley 1946:145), and third in a Pennsylvania study (Bennett & English 1939:29).

Lower volumes of wheat were reported occurring in the bobwhite crops from states in the western wheat belt. Wheat was fifteenth by volume in a Missouri study (Korschgen 1948:52) and twenty-second (Lee 1948:7) and twenty-first (Baumgartner *et al.* 1952:343) in two Oklahoma studies. During fall and early winter, wheat is apparently more readily available to bobwhites in areas to the northeast of the western wheat belt than it is to bobwhites in the wheat belt; this availability is probably due to differing agricultural practices.

**6. Common ragweed** comprised 4.58 per cent of the total crop contents and ranked third in frequency of occurrence (26.40 per cent) in southern Illinois. An annual weed of cultivated lands, waste places, roadsides, pastures, and newly abandoned fields, common ragweed has proved to be an important food of bobwhites in several studies. In Indiana, lesser ragweed ranked second (37.2 per cent) in frequency of occurrence and constituted 9.1 per cent of the volume (Reeves 1954:43). In Missouri, common ragweed occupied third place by volume (12.7 per cent) and occurred in 36.6 per cent of the crops (Korschgen 1948:52). In Virginia (Baldwin & Handley 1946:145), it was first by volume (21.3 per cent). In Tennessee (Cady 1944:12), it ranked second by per cent of total weight (14.29 per cent).

**7. White sassafras** made up 3.80 per cent of the crop contents and occurred in 5.23 per cent of the southern Illinois crops. Like wheat, white sassafras constituted the major portion of the contents of the individual crops in which it was found. This shrub is common in fencerows, in abandoned fields, and as an understory in woods of southern Illinois. While white sassafras is a common food of bobwhites in other midwestern states, it appears to be of little importance in southern and southwestern states. In a Missouri study, white sassafras was sixth by volume (2.9 per cent) and occurred in 4.7 per cent of the crops (Korschgen 1948:52). In an Indiana study, it ranked second by volume (21.2 per cent) and occurred in 21.2 per cent of the crops (Reeves 1954:43). No sizable volume of sassafras was found in the bobwhite diets studied in Virginia (Baldwin & Handley 1946:145) or Tennessee (Cady 1944:12), and none at all in Oklahoma (Lee 1948:20; Baumgartner *et al.* 1952).

**8. Desmodium** (also known as tick clover, tick trefoil, sticktight, and beggar's tick) accounted for 2.94 per cent of the total volume and ranked eighth (12.11 per cent) in frequency of occurrence in southern Illinois bobwhites. Most of the many perennial species of desmodium are native to wooded areas and are usually found on dry soils. Desmodium is an important bobwhite food throughout most of the Midwest and South. In a report from Missouri, desmodium comprised 2.3 per cent of the food, ranking eighth by volume and occurring in 10.7 per cent of the crops studied (Korschgen 1948:52). In a Virginia study (Baldwin & Handley 1946:145), it was also eighth by volume (3.6 per cent). Desmodium ranked third by weight (3.73 per cent) in a Tennessee study (Cady 1944:12) and was eleventh by volume (1.2 per cent) in an Indiana study (Reeves 1954:43).

**9. Slugs** furnished 2.81 per cent of the volume and ranked twelfth in frequency of occurrence (6.84 per cent) in the Illinois crops examined. Slugs were unlike most other animal foods in that several were often found in one crop. Slugs of the family Philomycidae are common in woodland and are usually over one-half inch in length. In this study, slugs were found in greater volumes than had been reported for other studies, although frequencies of occurrence were sometimes comparable. The greater volumes reported in this investigation may have resulted from our method, described earlier, of determining volume of animal foods. In Missouri, snails occurred in 3.4 per cent of the crops examined (Korschgen 1952:22). In Alabama, they comprised only 0.2 per cent of the food volume but occurred in 20.91 per cent of the crops examined (Gray 1940:23).

**10. Jewelweed** accounted for 1.82 per cent of the total crop contents and ranked eleventh in frequency of occurrence; it was found in 8.66 per cent of the crops examined in the present study. On wet, calcareous soils, this plant is common in partial shade. In a Missouri study, jewelweed comprised 0.2 per cent of the volume

and occurred in 1.3 per cent of the crops (Korschgen 1948:52). It was thirteenth by volume (1.8 per cent) in a report from Virginia (Baldwin & Handley 1946:145), and seventh (3.9 per cent) in an Indiana study (Reeves 1954:43), and, by weight, eleventh (0.56 per cent) in a Tennessee study (Cady 1944:12).

**11. Bidens** (also known as bur marigold, beggar tick, sticktight, and Spanish needle) formed 1.38 per cent of the total crop contents and was the fifth most frequently occurring food, being found in 18.98 per cent of the crops of southern Illinois bobwhites. Some species of bidens are annual and some are perennial; they are plants of open woods, roadsides, and fields and are generally found in wet places. Bidens formed a greater volume of the food of bobwhites in Illinois than in neighboring states. In Missouri, it occurred in 7.0 per cent of the crops examined and accounted for only 0.6 per cent of the volume (Korschgen 1948:52). Bidens averaged less than 1 per cent of the total food volume in reports from Virginia (Baldwin & Handley 1946:145) and Indiana (Reeves 1954:43) and of the total weight in Tennessee (Cady 1944:12).

**12. Cowpea** comprised 1.36 per cent of the volume of crop contents in southern Illinois and occurred in 1.73 per cent of the crops. The acreage of cowpea planted annually in Illinois is now small, because this crop has been replaced largely by soybean. Cowpea, like wheat and white sassafras, occurred in considerable quantity in individual crops; it is possibly a preferred food of the bobwhite. In Missouri, Korschgen (1948:52) found that cowpea formed 0.6 per cent of the volume and occurred in 0.9 per cent of the crops. Baldwin & Handley (1946:145) stated that cowpea ranked fifth by volume (5.1 per cent) in Virginia. In Alabama, Johnson & Pearson (1948:12) ranked cowpea second by volume (11.86 per cent).

**13. Short-horned grasshoppers** formed 1.32 per cent of the total volume of crop contents and occurred in 4.54 per cent of the southern Illinois bobwhite crops. Grasshoppers have been found to be the most important animal food in most studies of bobwhite foods. In a report from Missouri, they were the animal food taken in greatest quantity, comprising 0.8 per cent of the total volume and 7.7 per cent in frequency of occurrence (Korschgen 1948:52). Short-horned grasshoppers were seventeenth by volume (1 per cent) in a Virginia study (Baldwin & Handley 1946:145); in an Alabama study (Gray 1940:22), they formed 5.63 per cent of the volume of the November diet and 2.08 per cent of the foods taken in December, averaging 1.70 per cent for the 4-month winter season.

**14. Small wild bean** constituted 1 per cent of the crop contents and was the seventh most frequently found food, occurring in 12.35 per cent of the crops examined for the present study. Small wild bean is probably not generally abundant in southern Illinois; those crops in which it was found usually contained only a few beans. This plant, which grows locally in Illinois as well as in most of the Midwest and the South, is an annual of dry and sandy soil found on river banks, in idle fields, and in open woods. In Missouri, it was ninth by volume (1.8 per cent) and occurred in 17.9 per cent of the crops examined (Korschgen 1948:52). In Alabama, a species comparable to small wild bean made up 5.12, 2.11, and 1.04 per cent of the volume in three studies (Gray 1940:16; Allen & Pearson 1945*a*:9, 1945*b*:14). In an Indiana report, it was recorded as a trace (Reeves 1954:44).

**15. A few additional foods** found in southern Illinois bobwhite crops seem worthy of mention. Yellow foxtail, smooth crabgrass, lance-leaved ragweed, black gum, insect larvae, and smooth sumac individually formed 0.26 to 0.86 per cent of the total crop contents. Smooth crabgrass, yellow foxtail, witch grass, Pennsylvania smartweed, and ground beetles occurred frequently but were taken in small quantities. Most animal foods and some seeds, such as those of sumac and Pennsylvania smartweed, were seldom taken in great numbers by an individual bobwhite. Some seeds, particularly those of the grasses, were so small that the consumption of large numbers added little to the total volume. Some of the smallest seeds were probably incidental to the diet and were perhaps picked up while the bobwhites were feeding primarily on other foods. Only a negligible percentage of the total volume was made up of fragments of plant materials and insect parts that could not be identified as to kind.

## REGIONAL COMPARISON OF DIETS

Comparisons of data from other states with data from the present study, table 2, indicate that bobwhites in adjoining states – Indiana (Reeves 1954), Missouri (Korschgen 1948), and Kentucky (Barbour 1951) – have great similarity of diet to the bobwhites in Illinois. Nine of the 12 foods which made up 1 per cent or more of the bobwhite diet in Indiana also formed 1 per cent or more of the diet of Illinois bobwhites. Eight of 14 important foods in Missouri were of significance in Illinois. Each of the four foods found in greatest quantity in certain Kentucky bobwhites comprised 1 per cent or more of the diet in this study.

Bobwhite food habits in southern Illinois tend to be fairly similar to those reported in studies made in or near the same latitude as that of southern Illinois. The diets of bobwhites in Virginia (Baldwin & Handley 1946) and Pennsylvania (Bennett & English 1939) resembled the diet of Illinois bobwhites more than did diets of

Table 2.—Percentage of total volume of crop contents and rank of the food items making up at least 1 per cent of the total volume found in 4,606 bobwhite crops collected in southern Illinois during the hunting seasons in 1950 and 1951; also, com-

| Collection | Corn | | Soybean | | Korean and Japanese Lespedezas | | Oak (Acorns) | | Wheat | | Common Ragweed | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Per Cent of Volume | Rank | Per Cent of Volume | Rank | Per Cent of Volume | Rank | Per Cent of Volume | Rank | Per Cent of Volume | Rank | Per Cent of Volume | Rank |
| ILLINOIS — 4,606 crops collected Nov. 11-Dec. 11, 1950 and 1951 (present study)..... | 27.79 | 1 | 22.43 | 2 | 8.66 | 3 | 7.19 | 4 | 5.45 | 5 | 4.58 | 6 |
| MISSOURI — 5,472 crops collected Nov. 10-Dec. 31, 1940 and 1941 (Korschgen 1948)..... | 16.8 | 2 | 2.6 | 7 | 18.5* | 1 | 6.6 | 5 | † | | 12.7 | 3 |
| INDIANA — 831 crops collected Nov. 10-Dec. 20, 1947 and 1948 (Reeves 1954) ..... | 27.4· | 1 | 4.0 | 5 | 15.7* | 3 | 1.4 | 9 | 4.0 | 6 | 9.1 | 4 |
| KENTUCKY — 331 crops collected Nov. 24, 1941-Jan. 6, 1942 (Barbour 1951)..... | 8.9 | 3 | — | | 29.52* | 1 | — | | — | | 16.57 | 2 |
| TENNESSEE — 552 crops collected Nov. 25-Jan. 25, 1929-1931 (Cady 1944) — per cent by weight rather than volume..... | 1.43‡ | 6 | 3.57*‡ | 4 | 62.38‡ | 1 | †‡ | | 1.15‡ | 8 | 14.29‡ | 2 |
| VIRGINIA — 495 crops collected Nov. 15-Jan. 31, 1929-1931 (Baldwin & Handley 1946)..... | 3.4 | 10 | 7.6 | 3 | 9.7* | 2 | 3.7 | 7 | 4.0 | 6 | 21.3 | 1 |
| ALABAMA — 440 crops collected Nov. 20-Feb. 20, "several years" (Gray 1940)..... | † | | — | | 27.96* | 1 | 2.49 | 9 | — | | 1.76 | 12 |
| ALABAMA — 347 crops collected Dec., 1936-1939, 1941, and 1942 (Johnson & Pearson 1948)..... | 2.29 | 12 | 4.38 | 7 | 20.56* | 1 | 11.65 | 3 | — | | 8.88 | 4 |
| ALABAMA — 149 crops collected Nov., 1937-1939, 1942, and 1943 (Allen & Pearson 1945*a*) ..... | 3.21 | 8 | 2.11 | 11 | 1.54* | 14 | 23.71 | 1 | — | | — | |
| OKLAHOMA — 385 crops collected Nov. and Dec., 1946 and 1947 (Lee 1948) ..... | 3.83 | 8 | — | | 8.74* | 3 | 6.35 | 5 | 1.05 | 22 | 10.86* | 2 |
| OKLAHOMA — 1,771 crops collected Nov. 20-Jan. 1, 1939-1951 (including 150 from other months) (Baumgartner *et al.* 1952) ..... | 5.6 | 7 | — | | 8.7 | 5 | 10.9 | 2 | † | | 10.4 | 4 |
| PENNSYLVANIA — 61 crops collected Oct. 28-Nov. 26, 1938 (Bennett & English 1939)..... | 21 | 2 | — | | — | | † | | 9 | 3 | 25 | 1 |

*Grouping of food items differs slightly from that in the present study.
†Food item was reported as constituting less than 1 per cent of total volume.
‡Per cent by weight rather than volume.
**Figure is for a different but comparable species.

parable data from similar studies of bobwhite food habits by investigators in eight other states. Ranks were adjusted to correspond to groupings of food items in present study and are not necessarily the same as those given in the original reference.

| White Sassafras | | Desmodium | | Slugs | | Jewelweed | | Bidens | | Cowpea | | Short-Horned Grasshoppers | | Small Wild Bean | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Per Cent of Volume | Rank | Per Cent of Volume | Rank | Per Cent of Volume | Rank | Per Cent of Volume | Rank | Per Cent of Volume | Rank | Per Cent of Volume | Rank | Per Cent of Volume | Rank | Per Cent of Volume | Rank |
| 3.80 | 7 | 2.94 | 8 | 2.81 | 9 | 1.82 | 10 | 1.38 | 11 | 1.36 | 12 | 1.32 | 13 | 1.00 | 14 |
| 2.9 | 6 | 2.3 | 8 | — | | † | | † | | † | | † | | 1.8 | 9 |
| 21.2 | 2 | 1.2 | 11 | — | | 3.9** | 7 | † | | — | | † | | † | |
| — | | 5.36 | 4 | — | | — | | — | | — | | — | | — | |
| †‡ | | 3.73‡ | 3 | — | | †‡** | | †‡ | | *‡ | | — | | — | |
| † | | 3.6 | 8 | — | | 1.8 | 13 | † | | 5.1 | 5 | 1.0 | 17 | — | |
| — | | 9.99 | 2 | — | | — | | — | | 2.99 | 6 | 1.70 | 13 | — | |
| — | | 5.44 | 5 | — | | — | | — | | 11.86 | 2 | 1.93 | 13 | — | |
| — | | 3.76 | 7 | — | | — | | — | | 8.88 | 4 | 1.72 | 12 | — | |
| — | | † | | — | | — | | † | | † | | — | | 2.43 | 9 |
| — | | 1.3 | 15 | — | | — | | — | | — | | — | | 6.8 | 6 |
| — | | — | | — | | — | | — | | — | | † | | — | |

bobwhites in the South or Southwest. Ten of 18 foods forming 1 per cent or more of the diet of Virginia bobwhites and 3 of 5 foods of Pennsylvania bobwhites were found in quantities in the present study.

Food habits of bobwhites in Illinois showed a closer similarity to those of bobwhites in the South than to those of bobwhites in a southwestern state. Six of 9 foods that made up 1 per cent or more of the bobwhite diet in Tennessee (Cady 1944:12) were of importance in Illinois. In three Alabama studies, 7 of 16 foods (Allen & Pearson 1945*a*:9), 8 of 20 foods (Johnson & Pearson 1948:12), and 6 of 16 foods (Gray 1940:16-23) that made up 1 per cent or more of the bobwhite food were taken in quantity in Illinois. Food habits as revealed in two Oklahoma studies (Lee 1948, Baumgartner *et al.* 1952) indicated least similarity to those in this study; 6 of 23 and 6 of 19 foods respectively that made up 1 per cent or more of the volumes in Oklahoma formed 1 per cent or more of the diet of bobwhites in Illinois.

Corn, Korean and Japanese lespedezas, and common ragweed were foods found in quantity in crops of bobwhites throughout most of the bobwhite range. These foods formed 1 per cent or more of the total volume in 11 of the 12 studies reviewed. Desmodium and acorns were only slightly less common, forming 1 per cent or more of the diet in 10 and 9 studies respectively.

Soybean, wheat, cowpea, and short-horned grasshoppers were found in quantities in 5 to 7 of the 12 studies reviewed. Soybean and cowpea were basic foods in the Midwest and the South. In some studies insect material was treated as one group; grasshoppers would probably have appeared in more studies had insects been identified separately as to kind.

Small wild bean, jewelweed, and white sassafras each appeared in quantity in at least three states. Slugs and bidens were not noted in quantity in any study except the present one.

A number of foods reported in appreciable quantity in several bobwhite studies in other states were of minor importance or were missing in the diet of bobwhites in Illinois. The most conspicuous of these were the ashes. Ashes accounted for at least 1 per cent of the volume

Table 3.—For each of several cultivated foods, foods associated with cultivation, and old-field native foods, the percentage of bobwhite crops containing that food and the percentage of the total volume of crop contents comprised by that food in bobwhite crops collected in southern Illinois during the hunting seasons of 1950 and 1951 and for the two seasons combined.

| Food Item* | 1950 (2,326 Crops) | | 1951 (1,845 Crops) | | 1950 and 1951 Combined (4,171 Crops) | |
|---|---|---|---|---|---|---|
| | Per Cent of Total Occurrences | Per Cent of Total Crop Contents | Per Cent of Total Occurrences | Per Cent of Total Crop Contents | Per Cent of Total Occurrences | Per Cent of Total Crop Contents |
| CULTIVATED | | | | | | |
| Corn | 31.25 | 30.78 | 25.92 | 23.74 | 28.85 | 27.79 |
| Soybean | 26.20 | 29.05 | 17.04 | 13.47 | 22.08 | 22.43 |
| Wheat | 2.57 | 2.54 | 6.95 | 9.38 | 4.54 | 5.45 |
| Cowpea | 2.53 | 2.06 | 0.77 | 0.39 | 1.73 | 1.36 |
| *Total* | | *64.43* | | *46.98* | | *57.03* |
| ASSOCIATED WITH CULTIVATION | | | | | | |
| Korean and Japanese lespedezas | 44.44 | 9.89 | 39.53 | 7.00 | 42.23 | 8.66 |
| Common ragweed | 28.26 | 4.65 | 24.13 | 4.50 | 26.40 | 4.58 |
| Bidens | 17.25 | 1.09 | 21.09 | 1.78 | 18.98 | 1.38 |
| Yellow foxtail | 12.51 | 1.21 | 4.97 | 0.38 | 9.12 | 0.86 |
| Smooth crabgrass | 15.07 | 1.00 | 9.65 | 0.43 | 12.64 | 0.76 |
| Lance-leaved ragweed | 2.37 | 0.23 | 4.92 | 0.73 | 3.52 | 0.44 |
| *Total* | | *18.07* | | *14.82* | | *16.68* |
| OLD-FIELD NATIVE | | | | | | |
| Oak (acorns) | 6.27 | 4.62 | 13.56 | 10.66 | 9.55 | 7.19 |
| White sassafras | 0.75 | 0.36 | 10.71 | 8.44 | 5.23 | 3.80 |
| Desmodium | 7.18 | 0.91 | 18.15 | 5.69 | 12.11 | 2.94 |
| Jewelweed | 9.35 | 2.00 | 7.82 | 1.58 | 8.66 | 1.82 |
| Small wild bean | 10.73 | 1.05 | 14.33 | 0.94 | 12.35 | 1.00 |
| Black gum | 0.59 | 0.77 | — | — | 0.33 | 0.44 |
| Smooth sumac | 1.14 | 0.09 | 4.25 | 0.48 | 2.54 | 0.26 |
| *Total* | | *9.80* | | *27.79* | | *17.45* |

*Includes only those plant foods accounting for more than 0.25 per cent of the total food volume.

of bobwhite food in six of the studies reviewed, including those from three states (Missouri, Indiana, and Virginia) where the diets tended to be similar to that in this study. Milk pea, pine, partridge pea, and sweet gum were found in sizable amounts in most of the southern states; Johnson grass was reported in appreciable quantities in one southern and two Oklahoma studies. West of the Mississippi River, sorghum formed a large portion of the bobwhite diet.

## RELATIONSHIP OF AGRICULTURAL PRACTICES TO FOODS AVAILABLE

An effort was made to determine the relationship of agricultural practices to the kinds and quantities of foods taken by bobwhites. Those plant foods comprising more than 0.25 per cent of the total volume of crop contents were arbitrarily classified into three groups, table 3: (1) cultivated, (2) associated with cultivation, and (3) old-field native. *Cultivated foods* were those produced by intentionally grown domesticated plants; *foods associated with cultivation* were produced by plants not intentionally grown on lands currently or recently in cultivation; *old-field native foods* were those produced by plants found in advanced stages of succession on lands idle for a number of years. Korean and Japanese lespedezas were classed as associated with cultivation because the yearly acreage planted to these lespedezas was small in southern Illinois; their abundance and availability resulted from their persistence and ability to spread.

Cultivated plants formed 57.03 per cent of the volume of crop contents in 1950 and 1951 combined. In reports from Missouri (Korschgen 1952:11), Virginia (Baldwin & Handley 1946:149), and Oklahoma (Baumgartner *et al.* 1952:356), cultivated foods constituted a smaller amount of the food volume, 33.4, 25, and 29.0 per cent respectively. In the present study, plants associated with cultivation made up 16.68 per cent of the volume of crop contents and old-field native plants 17.45 per cent.

Cultivated foods found in bobwhite crops formed 64.43 per cent of the crop contents in 1950 and 46.98 per cent in 1951. Old-field native plants provided 9.80 per cent of the diet in 1950 and 27.79 per cent in 1951. Foods associated with cultivation showed the least change from one year to the next, comprising 18.07 per cent of the volume in 1950 and 14.82 per cent in 1951.

Although foods associated with cultivation were the least important group by volume, they occurred with the greatest frequency. Four items in this group (Korean and Japanese lespedezas, common ragweed, bidens, and smooth crabgrass) were found in more than 10 per cent of the crops examined; only two cultivated foods (corn and soybean) and two old-field native foods (desmodium and small wild bean) occurred with similar frequency.

The availability of cultivated foods in fall and early winter is affected by the time of harvest of agricultural crops. The supply of grain as food for the bobwhite is greatest immediately after the harvest; many cultivated foods are relatively inaccessible to the bobwhite before the harvest.

The times of planting and harvesting operations in 1951 were near normal, and, although they were somewhat later than usual in 1950, they were not much delayed. For both years, 95 per cent of the soybean crop was combined by the end of October, while the corn harvest was largely completed by late November.

Soybean, cowpea, and wheat are believed to deteriorate rapidly after exposure on the ground, while corn is relatively durable. If the grains that deteriorate rapidly are harvested later than usual, they may be more readily available to the bobwhites during the hunting season than if they are harvested at the usual time. This assumption offers a suitable explanation of the greater importance of soybean and cowpea in 1950 but fails to explain why wheat, presumably even more vulnerable to deterioration than these legumes, formed a larger portion of the diet in 1951, a year of earlier harvest and of adverse weather.

Perhaps an explanation lies in the food-cover relationship, figs. 6, 7, and 8. Harvested fields of soybean and cowpea are so nearly denuded of cover that bobwhites tend to restrict their feeding to the field borders. On the other hand, harvested wheat fields are more likely to be utilized by bobwhites than the interiors of dense, tall, uncut wheat stands. Possibly wheat, as well as the old-field native foods, made up a larger percentage of the diet in 1951 because the slightly earlier harvests of all crops that year, as compared to 1950, forced many of the birds out of the fields of harvested legumes. The deep snow of November 6-7, 1951, may well have abetted, or even initiated, this movement.

## INFLUENCE OF WEATHER ON DIETARY PATTERN

Yearly, seasonal, and even daily variations in the food consumed by bobwhites may result from weather. Any one of a number of closely related factors may result in a varying diet. During the growing season, weather influences the quantities of plant and animal species that are produced; the amounts of each are affected throughout the year. Weather also determines the time that plants become ripe and has some effect on the quality of their seeds. Agricultural practices, which can in themselves influence what foods are available to the bobwhite, are somewhat dependent on daily as

Fig. 6.—Harvested cornfield adjacent to brushy area and fencerow, an ideal combination of food and cover. However, a mechanically harvested field gives the bobwhite little concealing cover. Photo from Southern Illinois University Photo Service.

well as seasonal weather conditions. Along with the broad effects of weather, a specific condition—such as an ice or a snow storm—may cause the most striking variations in the bobwhite diet. Even a thin covering of ice can make most foods inaccessible to the bobwhite; snow can have the same effect.

For the study area, mean annual temperatures for both years were nearly normal—56.15 degrees F. in 1950 and 56.18 degrees F. in 1951. Precipitation was heavy in both years; it totaled 67.99 inches in 1950 and 54.05 inches in 1951 in contrast to the established annual average of 43.53 inches. The established average precipitation during the growing season (March through October) is 30.06 inches. Precipitation during the growing season in 1950 amounted to 38.94 inches. It was more nearly normal (31.25 inches) in 1951. The above figures were interpreted from climatological data reported by weather stations within the 34 counties represented in this study (U. S. Department of Commerce 1951, 1952).

Measurable quantities of snow covered the ground for two periods during the 1950 hunting season. During the first snow, which lasted from November 22 to 29, the depth did not exceed 1.3 inches. However, from December 6 to 11, 4 to slightly more than 7 inches of snow covered the ground throughout most of southern Illinois. No snow fell during the 1951 hunting season, but near-record snowfalls were recorded immediately before and after the hunting season.

Definite changes in food habits were apparent during the time when deep snow covered the ground, table 4. There was a substantial increase in the amount of soybean in the diet. Cowpea and purple meadow rue, the latter normally occurring in the crops in insignificant quantities, were the only other foods which increased considerably. Soybean and cowpea formed 57.45 per cent and 2.77 per cent respectively of the total crop contents during the period of deep snow. In contrast, these foods accounted for 18.79 per cent and 1.21 per cent respectively of the volume taken by the bobwhites under

normal weather conditions during the hunting seasons. The frequency with which soybean occurred in the crops rose from 25.92 per cent during the period of little or no snow to 35.59 per cent when there was 4 to slightly over 7 inches of snow, while frequency of occurrence of cowpea increased from 1.91 per cent to 4.66 per cent. When soybean or cowpea was found in a crop collected during the period of deep snow, it was often the only food present.

Field observations made during the period when snow covered the ground offered a possible explanation of the attending dietary changes. A nearly ideal combination of food and cover was formed in unharvested soybean and, to a lesser extent, in high soybean stubble. Beneath the snow there were large quantities of soybean pods and many connected pockets and openings. The snowfall was deep enough to make most foods unavailable at ground level. Snow formed a fairly continuous roof over the soybean fields, but it was not so heavy as to crush the soybean plants to the ground or to close the openings necessary for ingress or egress. The same situation seemed to exist in fields of cowpea. When covey ranges included such fields, the birds apparently utilized these fields almost exclusively. Inasmuch as heavy snow is unusual in southern Illinois and soybean is capable of maintaining bobwhites through winter weather (Damon 1949:24), this plant might well justify its use in food patches for areas devoted to bobwhite management.

The volume of corn in the diet remained fairly constant during the period of deep snow. That of most other foods declined sharply. The fact that the volume decreased for acorns, white sassafras, desmodium, smooth sumac, and other foods associated with heavy woody cover may be significant. The birds represented in this study apparently did not depend upon food associated with heavy woody cover during the period of deep snow.

Fig. 7.—A sassafras fencerow adjacent to wheat stubble, an excellent combination of food and cover for bobwhites in winter. Common ragweed, lespedeza, and wheat provide food; the stubble provides desirable roosting cover during the relatively mild winters of southern Illinois. Photo from Southern Illinois University Photo Service.

Table 4. — For each of several food items, the percentage of bobwhite crops containing that food and the percentage of the total volume of crop contents comprised by that food in bobwhite crops collected in southern Illinois during the period of normal weather conditions and during the period in which snow covered the ground to a minimum depth of 4 inches in the 1950 and 1951 hunting seasons combined.

| Food Item* | Per Cent of Total Occurrences | | Per Cent of Total Crop Contents | |
|---|---|---|---|---|
| | Normal Conditions† | Snow‡ | Normal Conditions† | Snow‡ |
| Corn | 34.90 | 30.93 | 27.93 | 26.38 |
| Soybean | 25.92 | 35.59 | 18.79 | 57.45 |
| Korean and Japanese lespedezas | 51.74 | 35.17 | 8.91 | 6.28 |
| Oak (acorns) | 11.89 | 5.08 | 7.60 | 3.29 |
| Wheat | 5.72 | 1.27 | 6.00 | 0.11 |
| Common ragweed | 33.15 | 9.75 | 5.01 | 0.44 |
| White sassafras | 6.67 | 0.42 | 4.19 | 0.02 |
| Desmodium | 14.87 | 9.75 | 3.19 | 0.60 |
| Slugs | 8.50 | 3.81 | 3.05 | 0.57 |
| Jewelweed | 10.89 | 2.97 | 1.98 | 0.21 |
| Bidens | 23.95 | 5.08 | 1.52 | 0.03 |
| Cowpea | 1.91 | 4.66 | 1.21 | 2.77 |
| Short-horned grasshoppers | 5.75 | 0.85 | 1.45 | 0.10 |
| Small wild bean | 15.67 | 2.12 | 1.10 | 0.02 |
| Yellow foxtail | 11.39 | 4.24 | 0.91 | 0.35 |
| Smooth crabgrass | 15.92 | 3.81 | 0.84 | 0.02 |
| Lance-leaved ragweed | 4.50 | — | 0.49 | — |
| Black gum | 0.42 | — | 0.49 | — |
| Insect larvae | 3.78 | — | 0.34 | — |
| Smooth sumac | 3.24 | 0.71 | 0.29 | 0.09 |
| Spiders | 4.14 | 0.85 | 0.27 | 0.03 |
| Stink bugs | 2.92 | 0.42 | 0.25 | 0.02 |
| Purple meadow rue | 0.08 | 1.27 | trace | 0.27 |
| *Total* | | | *95.81* | *99.05* |

*Includes all foods forming 0.25 per cent or more of the volume in any subdivision of this table.
†November 11 through December 5, 1950, plus the entire 1951 hunting season (3,599 crops).
‡December 6 through December 11, 1950 (236 crops).

## DIETARY TRENDS

The kinds and amounts of food found in crops from bobwhites killed during the first 10 days of each 31-day hunting season were compared with those of bobwhites killed during the last 10 days, table 5, to determine if dietary trends were indicated within the period for which data were available. The last 10-day period included the deep snow of December 6-11, 1950, which resulted in marked dietary changes; some interpretation of the data is necessary to take into account the effect of deep snow.

The volume of animal foods declined and that of plant foods increased as the season progressed. Similar trends appeared in other studies (Gray 1940; Korschgen 1948). Slugs were a notable exception to the general downward trend of animal food in Illinois. They not only appeared in the crops in greater quantities as the season progressed, table 5, but also remained part of the diet during the period of deep snow, table 4.

Individual plant foods found in crops in increased volume during the latter part of the hunting season included soybean, Korean and Japanese lespedezas, white sassafras, and smooth sumac. The volumes of corn, acorns, wheat, and desmodium were not characterized by marked change. The volumes of all remaining foods declined considerably.

Because the two 10-day periods compared were separated by only 11 days, an insufficient time to allow for much change, the trends are perhaps more apparent than real. However, some of the Illinois findings parallel observations made in other studies. Gray (1940) found that the volume of bush clovers in the diet of Alabama bobwhites increased through November, December, January, and February. Korschgen (1948) found in Missouri bobwhites that bush clovers increased in volume from early November to the end of December. In the present study, a greater volume of bush clovers occurred in the last 10 days of each hunting season than in the first 10 days. It appears that at least some of the long-term

Table 5.— For each of several food items, the percentage of bobwhite crops containing that food and the percentage of the total volume of crop contents comprised by that food in bobwhite crops collected in southern Illinois during the first and the last 10 days of the 31-day hunting seasons of 1950 and 1951 combined.

| Food Item* | Per Cent of Total Occurrences | | Per Cent of Total Crop Contents | |
|---|---|---|---|---|
| | First 10 Days (2,126 Crops) | Last 10 Days (740 Crops) | First 10 Days (2,126 Crops) | Last 10 Days (740 Crops) |
| Corn | 30.24 | 26.76 | 28.44 | 27.01 |
| Soybean | 20.88 | 27.30 | 19.71 | 36.06 |
| Korean and Japanese lespedezas | 39.04 | 47.03 | 5.62 | 11.46 |
| Oak (acorns) | 7.24 | 8.11 | 6.41 | 4.68 |
| Wheat | 3.57 | 3.51 | 4.98 | 3.21 |
| Common ragweed | 32.93 | 15.68 | 7.19 | 1.10 |
| White sassafras | 3.29 | 5.41 | 2.18 | 3.65 |
| Desmodium | 9.83 | 14.05 | 3.22 | 2.93 |
| Slugs | 5.55 | 8.51 | 2.35 | 2.69 |
| Jewelweed | 10.35 | 5.41 | 2.44 | 1.17 |
| Bidens | 20.84 | 10.41 | 1.61 | 0.55 |
| Cowpea | 2.11 | 2.30 | 2.16 | 1.34 |
| Short-horned grasshoppers | 5.79 | 0.95 | 1.86 | 0.18 |
| Small wild bean | 12.70 | 10.54 | 1.21 | 0.61 |
| Yellow foxtail | 12.56 | 3.78 | 1.24 | 0.18 |
| Smooth crabgrass | 18.67 | 4.19 | 1.46 | 0.02 |
| Lance-leaved ragweed | 3.95 | 3.24 | 0.71 | 0.14 |
| Black gum | 0.66 | — | 0.99 | — |
| Insect larvae | 3.15 | 2.70 | 0.36 | 0.20 |
| Smooth sumac | 2.05 | 3.50 | 0.19 | 0.47 |
| Spiders | 3.67 | 2.16 | 0.32 | 0.11 |
| Stink bugs | 2.21 | 1.35 | 0.25 | 0.08 |
| Ants | 3.67 | 3.38 | 0.26 | 0.11 |
| Rushfoil | 2.45 | 1.62 | 0.47 | 0.02 |
| Hogwort | 1.41 | — | 0.43 | — |
| Poison ivy | 1.98 | 1.22 | 0.25 | 0.05 |
| *Total* | | | *96.31* | *98.02* |

*Includes all foods forming 0.25 per cent or more of the volume in any subdivision of this table.

dietary trends of bobwhites may be indicated during a comparatively short hunting season.

## SUMMARY


Crops from 4,606 bobwhites were collected in 34 southern Illinois counties during the hunting seasons (November 11-December 11) of 1950 and 1951. Food was found in 4,171 of the crops.

For both years combined, materials identified as plant formed 93.94 per cent of the volume of crop contents, materials identified as animal 6.03 per cent, unidentified organic material 0.01 per cent, and grit 0.02 per cent.

Six plant families each comprised 1 per cent or more of the plant volume and together totaled 97.58 per cent of all plant food materials. These were the following: legumes 39.22 per cent, grasses 37.83 per cent, beeches 7.65 per cent, composites 6.91 per cent, laurels 4.04 per cent, and touch-me-nots 1.93 per cent. The Gastropoda and the Insecta accounted for most of the animal material, comprising respectively 48.64 and 44.56 per cent of the animal food items.

One hundred eighty-seven separate foods were found in the crops, but only 14 foods comprised 1 per cent or more each of the total volume. These included corn 27.79 per cent, soybean 22.43 per cent, Korean and Japanese lespedezas 8.66 per cent, acorns 7.19 per cent, wheat 5.45 per cent, common ragweed 4.58 per cent, white sassafras 3.80 per cent, desmodium 2.94 per cent, slugs 2.81 per cent, jewelweed 1.82 per cent, bidens 1.38 per cent, cowpea 1.36 per cent, short-horned grasshoppers 1.32 per cent, and small wild bean 1 per cent. These 14 foods accounted for 92.53 per cent of the total volume.

A comparison of the diet of bobwhites in southern Illinois with diets of bobwhites in other states reveals that slugs, bidens, and, particularly, soybean were taken in unusually large quantities in Illinois.

Most of the foods that made up 1 per cent or more of

Fig. 8.—Balanced habitat for the bobwhite during late summer, fall, and winter. Food is available in the wheat stubble; the woody fencerow provides excellent protective cover. Photo by W. D. Klimstra.

the diet of bobwhites in Illinois made up comparable amounts of the diets in the adjoining states of Indiana, Missouri, and Kentucky. Similarities in dietary patterns were progressively less in the following order: eastern states of approximately the same latitude as that of southern Illinois, southern states, and a southwestern state.

Cultivated plants were extremely important in the diet of southern Illinois bobwhites, accounting for 57.03 per cent of the total volume. Plants associated with cultivation made up 16.68 per cent and old-field native plants 17.45 per cent of the total volume. Those associated with cultivation occurred more frequently than cultivated plants or old-field native plants.

During a period when deep snow covered the ground, soybean comprised more than 50 per cent of the bobwhite diet. Cowpea and purple meadow rue were the only other foods occurring in increased volumes during this period. Foods associated with heavy woody cover decreased sharply in per cent of total volume.

A comparison of foods taken from the crops of bobwhites killed during the first 10 days of the 31-day hunting season with those killed during the last 10 days indicated that Korean and Japanese lespedezas, soybean, white sassafras, smooth sumac, and slugs increased in importance as the season progressed. A second group, including corn, acorns, desmodium, and wheat, was not characterized by marked change. Volumes of all other major foods decreased toward the end of the hunting season.

## LITERATURE CITED


Allen, Ralph H., Jr., and Allen M. Pearson
1945*a*. Ol' bobwhite's November menu. Ala. Conservation 17(5):8-10.
1945*b*. December diet of whistlin' bob. Ala. Conservation 17(6):8-9, 12, 14.

Baldwin, W. P., Jr., and C. O. Handley
1946. Winter food of bobwhite quail in Virginia. Jour. Wildlife Mgt. 10(2):142-9.

Barbour, Roger W.
1951. Observations on the fall and winter food of bob-white quail in Kentucky. Jour. Wildlife Mgt. 15(1):108.

Baumgartner, Frederick M., Meredith J. Morris, John L. Steele, and Jack E. Williams
1952. Oklahoma bobwhite food relations. N. Am. Wildlife Conf. Trans. 17:338-58.

Bennett, Logan J., and P. F. English
1939. The fall foods of ringneck pheasants and bobwhites. Pa. Game News 10(1):8-9, 29.

Braun, E. Lucy
1950. Deciduous forests of eastern North America. The Blakiston Company, Philadelphia, Pennsylvania. xiv + 596 pp.

Cady, Earl R.
1944. Winter quail foods on abandoned farm lands in the Norris Reservoir area. Tenn. Acad. Sci. Jour. 19(1):10-5.

Damon, David
1949. Winter foods of quail in Nebraska. Neb. Game, Forestation and Parks Comn. Wildlife Mgt. Notes 1(6):23-6.

Fernald, Merritt Lyndon
1950. Gray's manual of botany. Ed. 8. American Book Company, New York. 1,632 pp.

Gray, Anderson M.
1940. Winter foods of the bobwhite quail in the Black Belt Soil Province of Alabama. Alabama Department of Conservation, [Montgomery, Alabama] . 23 pp.

Johnson, Bruce C., and Allen M. Pearson
1948. Bobwhite's December diet. Ala. Conservation 20(6):4, 12, 13.

Jones, George Neville
1950. Flora of Illinois. Ed. 2. American Midland Naturalist Monograph 5. University of Notre Dame Press, Notre Dame, Indiana. 368 pp.

King, D. B., and R. K. Winters
1952. Forest resources and industries of Illinois. Ill. Ag. Exp. Sta. Bul. 562. 95 pp.

Korschgen, Leroy J.
1948. Late-fall and early-winter food habits of bobwhite quail in Missouri. Jour. Wildlife Mgt. 12(1):46-57.
1952. Analysis of the food habits of the bobwhite quail in Missouri. Missouri Conservation Commission, Division of Fish and Game, [Jefferson City, Missouri] . 59 pp.

Lee, Levon
1948. The fall and winter food of the bobwhite in Oklahoma. Oklahoma Game and Fish Department, Oklahoma City, Oklahoma. 23 pp.

Leighton, M. M., George E. Ekblaw, and Leland Horberg
1948. Physiographic divisions of Illinois. Jour. Geol. 56(1):16-33.

Marquardt, William C., and Thomas G. Scott
1952. It's in the bag. Ill. Wildlife 7(2):4-5.

Page, John L.
1949. Climate of Illinois: summary and analysis of long-time weather records. Ill. Ag. Exp. Sta. Bul. 532:93-364.

Reeves, Maurice C.
1954. Bobwhite quail investigation. Final report. Indiana Department of Conservation, Division of Fish and Game, Indianapolis, Indiana. 151 pp.

Ross, R. C., and H. C. M. Case
1956. Types of farming in Illinois: an analysis of differences by areas. Ill. Ag. Exp. Sta. Bul. 601. 88 pp.

Sailer, Reece I., Chairman
1955. Common names of insects approved by the Entomological Society of America. Ent. Soc. Am. Bul. 1(4):1-34.

United States Department of Agriculture
1938. Soils and men. Yearbook of Agriculture. House Document 398. Washington, D. C. 1,232 pp.

United States Department of Commerce
1951. Annual summary 1950. Climatological data: Illinois 55(13):245-54.
1952. Annual summary 1951. Climatological data: Illinois 56(13):233-42.

## APPENDIX

Table A. — The number of times represented and the percentage of the total volume of crop contents for each general kind of material found in bobwhite crops taken during the hunting seasons of 1950 and 1951 and for the 2 years combined.

| Contents of Bobwhite Crops | 1950 (2,534 Crops)* | | | 1951 (2,072 Crops)* | | | 1950 and 1951 Combined (4,606 Crops)* | | |
|---|---|---|---|---|---|---|---|---|---|
| | Times Represented | Per Cent of Total Volume | Per Cent of Volume of Food Kind | Times Represented | Per Cent of Total Volume | Per Cent of Volume of Food Kind | Times Represented | Per Cent of Total Volume | Per Cent of Volume of Food Kind |
| PLANT FOOD KINDS | 7,444 | 95.22 | | 6,063 | 92.21 | | 13,507 | 93.94 | |
| Undetermined | 207 | | 0.01 | 30 | | 0.01 | 237 | | 0.01 |
| Determined (Detailed in table B) | 7,237 | | 99.99 | 6,033 | | 99.99 | 13,270 | | 99.99 |
| ANIMAL FOOD KINDS | 837 | 4.75 | | 1,271 | 7.77 | | 2,108 | 6.03 | |
| Undetermined | 28 | | 0.03 | 5 | | 0.01 | 33 | | 0.02 |
| Determined (Detailed in table C) | 809 | | 99.97 | 1,266 | | 99.99 | 2,075 | | 99.98 |
| UNIDENTIFIED ORGANIC MATERIAL | 25 | 0.01 | | 3 | trace | | 28 | 0.01 | |
| GRIT | 56 | 0.02 | | 53 | 0.02 | | 109 | 0.02 | |

* Empty crops totaling 435 are included in this study; 208 from 1950 and 227 from 1951.

Table B.—For each of the determined kinds of plant food found in bobwhite crops taken during the hunting seasons of 1950 and 1951 and the 2 years combined, the times represented and the percentage of the total plant volume comprised by that food item. The food items are classified by family, genus, and species in all cases in which such identification was possible. The percentage of a genus made up by a species is given only when more than one species of that genus was identified. The nomenclature is for the most part that of Fernald (1950) and Jones (1950).

| Plant Food Group | November 11-December 11, 1950 (2,534 Crops of Which 2,326 Contained Food) | | | | November 11-December 11, 1951 (2,072 Crops of Which 1,845 Contained Food) | | | | Data from 1950 and 1951 Combined (4,606 Crops of Which 4,171 Contained Food) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Times Represented | Per Cent of Total Plant Food | Per Cent of Family | Per Cent of Genus | Times Represented | Per Cent of Total Plant Food | Per Cent of Family | Per Cent of Genus | Times Represented | Per Cent of Total Plant Food | Per Cent of Family | Per Cent of Genus |
| LEGUME FAMILY (LEGUMINOSAE) | 2,422 | 45.42 | | | 2,085 | 30.57 | | | 4,507 | 39.22 | | |
| Soybean *(Glycine max)* | 664 | | 67.17 | | 353 | | 47.81 | | 1,017 | | 60.88 | |
| Bush clovers *(Lespedeza)* | 1,142 | | 22.88 | | 853 | | 24.94 | | 1,995 | | 23.55 | |
| Korean and Japanese lespedezas *(L. stipulacea* and *L. striata)* | 1,126 | | | 99.94 | 819 | | | 99.61 | 1,945 | | | 99.82 |
| Bush clover *(L. capitata)* | 16 | | | 0.06 | 29 | | | 0.15 | 45 | | | 0.09 |
| Bicolor bush clover *(L. bicolor)* | — | | | — | 4 | | | 0.18 | 4 | | | 0.06 |
| Virginian bush clover *(L. virginica)* | — | | | — | 1 | | | 0.06 | 1 | | | 0.02 |
| Desmodiums *(Desmodium)* | 182 | | 2.11 | | 376 | | 20.19 | | 558 | | 7.99 | |
| Cowpea *(Vigna sinensis)* | 64 | | 4.78 | | 16 | | 1.40 | | 80 | | 3.68 | |
| Wild beans *(Strophostyles)* | 275 | | 2.52 | | 321 | | 3.60 | | 596 | | 2.87 | |
| Small wild bean *(S. leiosperma)* | 272 | | | 96.52 | 297 | | | 92.18 | 569 | | | 94.75 |
| Trailing wild bean *(S. helvola)* | 3 | | | 3.48 | 17 | | | 6.78 | 20 | | | 4.83 |
| Pink wild bean *(S. umbellata)* | — | | | — | 7 | | | 1.04 | 7 | | | 0.42 |
| Hog peanut *(Amphicarpa bracteata)* | 8 | | 0.10 | | 56 | | 1.40 | | 64 | | 0.52 | |
| Black locust *(Robinia pseudoacacia)* | 13 | | 0.28 | | 17 | | 0.31 | | 30 | | 0.29 | |
| Sennas *(Cassia)* | 66 | | 0.15 | | 91 | | 0.35 | | 157 | | 0.22 | |
| Partridge pea *(C. fasciculata)* | 38 | | | 67.09 | 72 | | | 85.53 | 110 | | | 76.81 |
| Wild sensitive plant *(C. nictitans)* | 28 | | | 32.91 | 18 | | | 14.10 | 46 | | | 22.99 |
| Wild senna *(C. marilandica)* | — | | | — | 1 | | | 0.38 | 1 | | | 0.20 |
| Clovers *(Trifolium)* | 4 | | trace | | 2 | | trace | | 6 | | trace | |
| Red clover *(T. pratense)* | 2 | | | 56.49 | 2 | | | 100.00 | 4 | | | 73.84 |
| Crimson clover *(T. incarnatum)* | 2 | | | 43.51 | — | | | — | 2 | | | 26.16 |
| Vetches *(Vicia)* | 2 | | trace | | — | | — | | 2 | | trace | |
| Sweet clover *(Melilotus indica)* | 1 | | trace | | — | | — | | 1 | | trace | |
| Prairie trefoil *(Lotus americanus)* | 1 | | trace | | — | | — | | 1 | | trace | |
| GRASS FAMILY (GRAMINEAE) | 2,234 | 37.88 | | | 1,509 | 37.76 | | | 3,743 | 37.83 | | |
| Corn *(Zea mays)* | 792 | | 85.32 | | 537 | | 68.21 | | 1,329 | | 78.19 | |
| Wheat *(Triticum aestivum)* | 65 | | 7.05 | | 144 | | 26.93 | | 209 | | 15.33 | |
| Bristly foxtails *(Setaria)* | 351 | | 3.43 | | 172 | | 1.83 | | 523 | | 2.76 | |
| Yellow foxtail *(S. lutescens)* | 317 | | | 98.05 | 103 | | | 60.29 | 420 | | | 87.64 |
| Faber's foxtail *(S. faberii)* | — | | | — | 51 | | | 33.76 | 51 | | | 9.31 |
| Green foxtail *(S. viridis)* | 26 | | | 0.83 | 11 | | | 4.25 | 37 | | | 1.77 |
| Italian millet *(S. italica)* | 8 | | | 1.12 | 7 | | | 1.70 | 15 | | | 1.28 |
| Crabgrasses *(Digitaria)* | 513 | | 3.08 | | 246 | | 1.29 | | 759 | | 2.33 | |
| Smooth crabgrass *(D. ischaemum)* | 382 | | | 90.28 | 200 | | | 96.26 | 582 | | | 91.66 |
| Common crabgrass *(D. sanguinalis)* | 119 | | | 7.14 | 43 | | | 3.49 | 162 | | | 6.30 |
| Finger grass *(D. filiformis)* | 12 | | | 2.57 | 1 | | | 0.02 | 13 | | | 1.99 |
| Crabgrasses *(D. spp.)* | — | | | — | 2 | | | 0.23 | 2 | | | 0.05 |
| Panic grasses *(Panicum)* | 380 | | 0.76 | | 263 | | 0.90 | | 643 | | 0.82 | |
| Switchgrass *(P. virgatum)* | 4 | | | 0.45 | 172 | | | 93.28 | 176 | | | 43.03 |
| Fall panicum *(P. dichotomiflorum)* | 115 | | | 71.98 | 25 | | | 2.72 | 140 | | | 40.21 |
| Witch grass *(P. capillare)* | 261 | | | 27.57 | 50 | | | 3.49 | 311 | | | 16.52 |
| Panic grasses *(P. spp.)* | — | | | — | 8 | | | 0.25 | 8 | | | 0.11 |
| Beaked panic grass *(P. anceps)* | — | | | — | 7 | | | 0.19 | 7 | | | 0.09 |
| Few-flowered panic grass *(P. oligosanthes)* | — | | | — | 1 | | | 0.08 | 1 | | | 0.04 |

Table B.—Continued

| Plant Food Group | November 11-December 11, 1950 (2,534 Crops of Which 2,326 Contained Food) | | | | November 11-December 11, 1951 (2,072 Crops of Which 1,845 Contained Food) | | | | Data from 1950 and 1951 Combined (4,606 Crops of Which 4,171 Contained Food) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Times Represented | Per Cent of Total Plant Food | Per Cent of Family | Per Cent of Genus | Times Represented | Per Cent of Total Plant Food | Per Cent of Family | Per Cent of Genus | Times Represented | Per Cent of Total Plant Food | Per Cent of Family | Per Cent of Genus |
| Paspalums *(Paspalum)* | 104 | | 0.28 | | 126 | | 0.25 | | 230 | | 0.27 | |
| Paspalums *(P. spp.)* | 104 | | | 100.00 | — | | | — | 104 | | | 60.88 |
| Field paspalum *(P. laeve)* | — | | | — | 65 | | | 63.02 | 65 | | | 24.65 |
| Ciliate-leaved paspalum *(P. ciliatifolium)* | — | | | — | 30 | | | 28.52 | 30 | | | 11.16 |
| Paspalum *(P. pubiflorum)* | — | | | — | 31 | | | 8.46 | 31 | | | 3.31 |
| Oats *(Avena sativa)* | — | | — | | 2 | | 0.54 | | 2 | | 0.23 | |
| Cheat *(Bromus secalinus)* | 12 | | 0.04 | | 6 | | 0.01 | | 18 | | 0.03 | |
| Rye *(Secale cereale)* | 3 | | 0.02 | | 1 | | 0.02 | | 4 | | 0.02 | |
| Johnson grass *(Sorghum halepense)* | 1 | | 0.01 | | 2 | | 0.03 | | 3 | | 0.02 | |
| Barnyard grass *(Echinochloa crusgalli)* | 1 | | 0.01 | | 3 | | trace | | 4 | | 0.01 | |
| Broom sedge *(Andropogon virginicus)* | 5 | | trace | | 1 | | trace | | 6 | | trace | |
| Meadow grasses *(Poa)* | 2 | | trace | | 3 | | trace | | 5 | | trace | |
| Timothy *(Phleum pratense)* | 2 | | trace | | — | | — | | 2 | | trace | |
| Wild ryes *(Elymus)* | 2 | | trace | | — | | — | | 2 | | trace | |
| Little barley *(Hordeum pusillum)* | — | | — | | 2 | | trace | | 2 | | trace | |
| Orchard grass *(Dactylis glomerata)* | 1 | | trace | | — | | — | | 1 | | trace | |
| Rice cutgrass *(Leersia oryzoides)* | — | | — | | 1 | | trace | | 1 | | trace | |
| BEECH FAMILY (FAGACEAE) | 159 | 4.85 | | | 281 | 11.57 | | | 440 | 7.65 | | |
| Oaks *(Quercus)* | 159 | | 100.00 | | 281 | | 100.00 | | 440 | | 100.00 | |
| COMPOSITE FAMILY (COMPOSITAE) | 1,245 | 6.36 | | | 1,078 | 7.67 | | | 2,323 | 6.91 | | |
| Ragweeds *(Ambrosia)* | 799 | | 81.97 | | 626 | | 74.76 | | 1,425 | | 78.63 | |
| Common ragweed *(A. elatior)* | 716 | | | 93.68 | 500 | | | 85.03 | 1,216 | | | 89.87 |
| Lance-leaved ragweed *(A. bidentata)* | 60 | | | 4.70 | 102 | | | 13.81 | 162 | | | 8.72 |
| Great ragweed *(A. trifida)* | 23 | | | 1.61 | 24 | | | 1.16 | 47 | | | 1.42 |
| Bidens *(Bidens)* | 437 | | 17.94 | | 437 | | 25.11 | | 874 | | 21.26 | |
| Sunflowers *(Helianthus)* | 2 | | 0.05 | | 6 | | 0.07 | | 8 | | 0.06 | |
| Field thistle *(Cirsium discolor)* | 3 | | 0.01 | | 9 | | 0.06 | | 12 | | 0.04 | |
| Crownbeard *(Verbesina)* | 2 | | 0.01 | | — | | — | | 2 | | 0.01 | |
| Sumpweed *(Iva ciliata)* | 2 | | 0.01 | | — | | — | | 2 | | 0.01 | |
| LAUREL FAMILY (LAURACEAE) | 19 | 0.38 | | | 222 | 9.15 | | | 241 | 4.04 | | |
| White sassafras *(Sassafras albidum)* | 19 | | 100.00 | | 222 | | 100.00 | | 241 | | 100.00 | |
| TOUCH-ME-NOT FAMILY (BALSAMINACEAE) | 237 | 2.10 | | | 162 | 1.71 | | | 399 | 1.93 | | |
| Jewelweed *(Impatiens pallida)* | 237 | | 100.00 | | 162 | | 100.00 | | 399 | | 100.00 | |
| CASHEW FAMILY (ANACARDIACEAE) | 92 | 0.36 | | | 142 | 0.75 | | | 234 | 0.52 | | |
| Sumacs *(Rhus)* | 92 | | 100.00 | | 142 | | 100.00 | | 234 | | 100.00 | |
| Smooth sumac *(R. glabra)* | 29 | | | 26.54 | 88 | | | 69.90 | 117 | | | 52.57 |
| Poison ivy *(R. radicans)* | 52 | | | 60.08 | 20 | | | 17.79 | 72 | | | 34.71 |
| Sumacs *(R. spp.)* | 11 | | | 13.39 | 34 | | | 12.31 | 45 | | | 12.72 |
| SPURGE FAMILY (EUPHORBIACEAE) | 100 | 0.74 | | | 106 | 0.19 | | | 206 | 0.51 | | |
| Croptons *(Croton)* | 45 | | 50.04 | | 31 | | 57.40 | | 76 | | 51.17 | |
| Hogwort *(C. capitatus)* | 30 | | | 88.13 | 8 | | | 61.02 | 38 | | | 83.46 |
| Sand croton *(C. glandulosus)* | 8 | | | 7.20 | 12 | | | 20.67 | 20 | | | 9.52 |
| Prairie tea *(C. monanthogynus)* | 7 | | | 4.67 | 11 | | | 18.31 | 18 | | | 7.02 |
| Rushfoil *(Crotonopsis elliptica)* | 51 | | 49.30 | | 26 | | 16.87 | | 77 | | 44.31 | |
| Three-seeded mercury *(Acalypha virginica)* | 4 | | 0.66 | | 33 | | 16.53 | | 37 | | 3.10 | |
| Spurges *(Chamaesyce)* | — | | — | | 16 | | 9.20 | | 16 | | 1.41 | |
| Spurges *(C. spp.)* | — | | | — | 15 | | | 99.25 | 15 | | | 99.25 |
| Spurge *(C. glyptosperma)* | — | | | — | 1 | | | 0.75 | 1 | | | 0.75 |

Table B.—Continued

| Plant Food Group | November 11-December 11, 1950 (2,534 Crops of Which 2,326 Contained Food) | | | | November 11-December 11, 1951 (2,072 Crops of Which 1,845 Contained Food) | | | | Data from 1950 and 1951 Combined (4,606 Crops of Which 4,171 Contained Food) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Times Represented | Per Cent of Total Plant Food | Per Cent of Family | Per Cent of Genus | Times Represented | Per Cent of Total Plant Food | Per Cent of Family | Per Cent of Genus | Times Represented | Per Cent of Total Plant Food | Per Cent of Family | Per Cent of Genus |
| SOUR GUM FAMILY (NYSSACEAE) | 15 | 0.81 | | | — | — | | | 15 | 0.47 | | |
| Black gum *(Nyssa sylvatica)* | 15 | | 100.00 | | — | | — | | 15 | | 100.00 | |
| WITCH-HAZEL FAMILY (HAMAMELIDACEAE) | 35 | 0.22 | | | 14 | 0.07 | | | 49 | 0.16 | | |
| Sweet gum *(Liquidambar styraciflua)* | 35 | | 100.00 | | 14 | | 100.00 | | 49 | | 100.00 | |
| BUCKWHEAT FAMILY (POLYGONACEAE) | 214 | 0.19 | | | 94 | 0.08 | | | 308 | 0.14 | | |
| Smartweeds *(Polygonum)* | 193 | | 98.25 | | 94 | | 100.00 | | 287 | | 98.64 | |
| Climbing false buckwheat *(P. scandens)* | 44 | | | 47.84 | 22 | | | 59.20 | 66 | | | 50.39 |
| Pennsylvania smartweed *(P. pensylvanicum)* | 102 | | | 23.82 | 47 | | | 28.16 | 149 | | | 24.80 |
| Common smartweed *(P. hydropiper)* | 46 | | | 26.67 | 25 | | | 12.64 | 71 | | | 23.52 |
| Smartweed *(P. lapathifolium)* | 1 | | | 1.67 | — | | | — | 1 | | | 1.29 |
| Docks *(Rumex)* | 21 | | 1.75 | | — | | — | | 21 | | 1.36 | |
| Field sorrel *(R. acetosella)* | 9 | | | 68.48 | — | | | — | 9 | | | 68.48 |
| Curly dock *(R. crispus)* | 8 | | | 17.12 | — | | | — | 8 | | | 17.12 |
| Pale dock *(R. altissimus)* | 4 | | | 14.40 | — | | | — | 4 | | | 14.40 |
| MULBERRY FAMILY (MORACEAE) | 10 | 0.11 | | | 17 | 0.13 | | | 27 | 0.12 | | |
| Osage orange *(Maclura pomifera)* | 10 | | 100.00 | | 17 | | 100.00 | | 27 | | 100.00 | |
| VINE FAMILY (VITACEAE) | 21 | 0.12 | | | 32 | 0.07 | | | 53 | 0.10 | | |
| Grapes *(Vitis)* | 21 | | 100.00 | | 32 | | 100.00 | | 53 | | 100.00 | |
| Grapes *(V. spp.)* | 21 | | | 100.00 | 10 | | | 26.72 | 31 | | | 77.50 |
| Winter grape *(V. cinerea)* | — | | | — | 9 | | | 37.90 | 9 | | | 11.64 |
| Fox grape *(V. labrusca)* | — | | | — | 10 | | | 28.95 | 10 | | | 8.89 |
| Frost grape *(V. vulpina)* | — | | | — | 3 | | | 6.43 | 3 | | | 1.98 |
| NIGHTSHADE FAMILY (SOLANACEAE) | 71 | 0.12 | | | 29 | 0.04 | | | 100 | 0.09 | | |
| Nightshades *(Solanum)* | 70 | | 99.40 | | 29 | | 100.00 | | 99 | | 99.52 | |
| Horse nettle *(S. carolinense)* | 48 | | | 95.83 | 15 | | | 89.64 | 63 | | | 94.59 |
| Black nightshade *(S. nigrum)* | 22 | | | 4.17 | 14 | | | 10.36 | 36 | | | 5.41 |
| Ground cherry *(Physalis)* | 1 | | 0.60 | | — | | — | | 1 | | 0.48 | |
| ROSE FAMILY (ROSACEAE) | 49 | 0.05 | | | 18 | 0.07 | | | 67 | 0.06 | | |
| Plums *(Prunus)* | 2 | | 10.06 | | 5 | | 94.45 | | 7 | | 53.92 | |
| Plums *(P. spp.)* | 2 | | | 100.00 | 1 | | | 83.61 | 3 | | | 85.07 |
| Wild black cherry *(P. serotina)* | — | | | — | 4 | | | 16.39 | 4 | | | 14.93 |
| White avens *(Geum canadense)* | 31 | | 61.79 | | 11 | | 3.07 | | 42 | | 31.27 | |
| Brambles *(Rubus)* | 13 | | 17.54 | | 1 | | 0.41 | | 14 | | 8.64 | |
| Roses *(Rosa)* | 3 | | 10.61 | | — | | — | | 3 | | 5.10 | |
| Wild sweet crabapple *(Malus coronaria)* | — | | — | | 1 | | 2.06 | | 1 | | 1.07 | |
| MADDER FAMILY (RUBIACEAE) | 31 | 0.07 | | | 17 | 0.01 | | | 48 | 0.05 | | |
| Rough buttonweed *(Diodia teres)* | 31 | | 100.00 | | 17 | | 100.00 | | 48 | | 100.00 | |
| SPIDERWORT FAMILY (COMMELINACEAE) | 22 | 0.07 | | | — | — | | | 22 | 0.04 | | |
| Dayflower *(Commelina diffusa)* | 22 | | 100.00 | | — | | — | | 22 | | 100.00 | |
| CROWFOOT FAMILY (RANUNCULACEAE) | 6 | 0.05 | | | — | — | | | 6 | 0.03 | | |
| Purple meadow rue *(Thalictrum dasycarpum)* | 6 | | 100.00 | | — | | — | | 6 | | 100.00 | |
| HONEYSUCKLE FAMILY (CAPRIFOLIACEAE) | 39 | 0.04 | | | 6 | 0.01 | | | 45 | 0.02 | | |
| Japanese honeysuckle *(Lonicera japonica)* | 23 | | 83.45 | | — | | — | | 23 | | 76.24 | |
| Coralberry *(Symphoricarpos orbiculatus)* | 14 | | 15.83 | | 6 | | 100.00 | | 20 | | 23.11 | |
| Common elder *(Sambucus canadensis)* | 2 | | 0.72 | | — | | — | | 2 | | 0.66 | |

Table B.—Continued

| Plant Food Group | November 11-December 11, 1950 (2,534 Crops of Which 2,326 Contained Food) | | | | November 11-December 11, 1951 (2,072 Crops of Which 1,845 Contained Food) | | | | Data from 1950 and 1951 Combined (4,606 Crops of Which 4,171 Contained Food) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Times Represented | Per Cent of Total Plant Food | Per Cent of Family | Per Cent of Genus | Times Represented | Per Cent of Total Plant Food | Per Cent of Family | Per Cent of Genus | Times Represented | Per Cent of Total Plant Food | Per Cent of Family | Per Cent of Genus |
| MINT FAMILY (LABIATAE) | 3 | trace | | | 4 | 0.05 | | | 7 | 0.02 | | |
| Shrubby perilla *(Perilla frutescens)* | – | | – | | 4 | | 100.00 | | 4 | | 99.57 | |
| Heal-all *(Prunella vulgaris)* | 3 | | 100.00 | | – | | – | | 3 | | 0.43 | |
| MALLOW FAMILY (MALVACEAE) | 31 | 0.01 | | | 14 | trace | | | 45 | 0.01 | | |
| Prickly mallow *(Sida spinosa)* | 29 | | 95.98 | | 11 | | 71.43 | | 40 | | 91.69 | |
| Velvetleaf *(Abutilon theophrasti)* | 2 | | 4.02 | | 3 | | 28.57 | | 5 | | 8.31 | |
| OLIVE FAMILY (OLEACEAE) | – | – | | | 30 | 0.03 | | | 30 | 0.01 | | |
| Ashes *(Fraxinus)* | – | | – | | 30 | | 100.00 | | 30 | | 100.00 | |
| MILKWEED FAMILY (ASCLEPIADACEAE) | 9 | 0.01 | | | 11 | 0.01 | | | 20 | 0.01 | | |
| Milkweeds *(Asclepias)* | 9 | | 100.00 | | 11 | | 100.00 | | 20 | | 100.00 | |
| DOGWOOD FAMILY (CORNACEAE) | 4 | 0.01 | | | 6 | trace | | | 10 | 0.01 | | |
| Dogwoods *(Cornus)* | 4 | | 100.00 | | 6 | | 100.00 | | 10 | | 100.00 | |
| Red osier dogwood *(C. stolonifera)* | 3 | | | 88.79 | 6 | | | 100.00 | 9 | | | 90.18 |
| Flowering dogwood *(C. florida)* | 1 | | | 11.21 | – | | | – | 1 | | | 9.82 |
| VIOLET FAMILY (VIOLACEAE) | – | – | | | 8 | 0.01 | | | 8 | 0.01 | | |
| Violets *(Viola)* | – | | – | | 8 | | 100.00 | | 8 | | 100.00 | |
| WOOD SORREL FAMILY (OXALIDACEAE) | 58 | 0.01 | | | 22 | trace | | | 80 | trace | | |
| Wood sorrel *(Oxalis stricta)* | 58 | | 100.00 | | 22 | | 100.00 | | 80 | | 100.00 | |
| AMARANTH FAMILY (AMARANTHACEAE) | 35 | trace | | | 19 | trace | | | 54 | trace | | |
| Pigweed *(Amaranthus retroflexus)* | 35 | | 100.00 | | 19 | | 100.00 | | 54 | | 100.00 | |
| GOOSEFOOT FAMILY (CHENOPODIACEAE) | 32 | trace | | | 11 | trace | | | 43 | trace | | |
| Lamb's quarter *(Chenopodium album)* | 32 | | 100.00 | | 11 | | 100.00 | | 43 | | 100.00 | |
| BORAGE FAMILY (BORAGINACEAE) | 10 | trace | | | 9 | trace | | | 19 | trace | | |
| Scorpion grass *(Myosotis verna)* | 10 | | 100.00 | | 9 | | 100.00 | | 19 | | 100.00 | |
| SEDGE FAMILY (CYPERACEAE) | 5 | trace | | | 5 | trace | | | 10 | trace | | |
| Sedge *(Carex stricta)* | 3 | | 58.82 | | 5 | | 100.00 | | 8 | | 77.15 | |
| Umbrella sedge *(Cyperus)* | 1 | | 40.11 | | – | | – | | 1 | | 22.26 | |
| Blunt spike rush *(Eleocharis obtusa)* | 1 | | 1.07 | | – | | – | | 1 | | 0.59 | |
| CARPETWEED FAMILY (AIZOACEAE) | – | – | | | 7 | trace | | | 7 | trace | | |
| Carpetweed *(Mollugo verticillata)* | – | | – | | 7 | | 100.00 | | 7 | | 100.00 | |
| BIGNONIA FAMILY (BIGNONIACEAE) | – | – | | | 5 | trace | | | 5 | trace | | |
| Trumpet creeper *(Campsis radicans)* | – | | – | | 5 | | 100.00 | | 5 | | 100.00 | |
| PINE FAMILY (PINACEAE) | 3 | trace | | | – | – | | | 3 | trace | | |
| Junipers *(Juniperus)* | 3 | | 100.00 | | – | | – | | 3 | | 100.00 | |
| Common juniper *(J. communis)* | 1 | | | 68.75 | – | | | – | 1 | | | 68.75 |
| Red cedar *(J. virginiana)* | 2 | | | 31.25 | – | | | – | 2 | | | 31.25 |
| CONVOLVULUS FAMILY (CONVOLVULACEAE) | 3 | 0.01 | | | – | – | | | 3 | trace | | |
| Field bindweed *(Convolvulus arvensis)* | 3 | | 100.00 | | – | | – | | 3 | | 100.00 | |

Table B.—Continued

| Plant Food Group | November 11-December 11, 1950 (2,534 Crops of Which 2,326 Contained Food) | | | | November 11-December 11, 1951 (2,072 Crops of Which 1,845 Contained Food) | | | | Data from 1950 and 1951 Combined (4,606 Crops of Which 4,171 Contained Food) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Times Represented | Per Cent of Total Plant Food | Per Cent of Family | Per Cent of Genus | Times Represented | Per Cent of Total Plant Food | Per Cent of Family | Per Cent of Genus | Times Represented | Per Cent of Total Plant Food | Per Cent of Family | Per Cent of Genus |
| VERVAIN FAMILY (VERBENACEAE) | — | — | | | 2 | trace | | | 2 | trace | | |
| Blue vervain *(Verbena hastata)* | — | | — | | 2 | | 100.00 | | 2 | | 100.00 | |
| PINK FAMILY (CARYOPHYLLACEAE) | 1 | trace | | | — | — | | | 1 | trace | | |
| Common chickweed *(Stellaria media)* | 1 | | 100.00 | | — | | — | | 1 | | 100.00 | |
| GERANIUM FAMILY (GERANIACEAE) | 1 | trace | | | — | — | | | 1 | trace | | |
| Cranesbill *(Geranium carolinianum)* | 1 | | 100.00 | | — | | — | | 1 | | 100.00 | |
| MUSTARD FAMILY (CRUCIFERAE) | 1 | trace | | | — | — | | | 1 | trace | | |
| Mustard *(Brassica)* | 1 | | 100.00 | | — | | — | | 1 | | 100.00 | |
| POKEWEED FAMILY (PHYTOLACCACEAE) | 1 | trace | | | — | — | | | 1 | trace | | |
| Pokeweed *(Phytolacca americana)* | 1 | | 100.00 | | — | | — | | 1 | | 100.00 | |
| NETTLE FAMILY (URTICACEAE) | 1 | trace | | | — | — | | | 1 | trace | | |
| Nettle *(Urtica)* | 1 | | 100.00 | | — | | — | | 1 | | 100.00 | |
| LILY FAMILY (LILIACEAE) | 1 | trace | | | — | — | | | 1 | trace | | |
| Greenbrier *(Smilax)* | 1 | | 100.00 | | — | | — | | 1 | | 100.00 | |
| PLANTAIN FAMILY (PLANTAGINACEAE) | 1 | trace | | | — | — | | | 1 | trace | | |
| Pursh's plantain *(Plantago purshii)* | 1 | | 100.00 | | — | | — | | 1 | | 100.00 | |
| STAFF-TREE FAMILY (CELASTRACEAE) | — | — | | | 1 | trace | | | 1 | trace | | |
| Climbing bittersweet *(Celastrus scandens)* | — | | — | | 1 | | 100.00 | | 1 | | 100.00 | |
| PARSLEY FAMILY (UMBELLIFERAE) | — | — | | | 1 | trace | | | 1 | trace | | |
| Large-fruited snakeroot *(Sanicula trifoliata)* | — | | — | | 1 | | 100.00 | | 1 | | 100.00 | |
| LEAF MATERIAL | 16 | trace | | | 66 | 0.03 | | | 82 | 0.02 | | |

Table C.—For each of the determined kinds of animal food found in bobwhite crops taken during the hunting seasons of 1950 and 1951 and the 2 years combined, the times represented and the percentage of the total animal volume comprised by that food item. The foods are classified by class, order, and family in all cases in which such identification was possible. The percentage of an order made up by a family is given only when more than one family in that order was identified. The nomenclature is that of Sailer (1955).

| Animal Food Group | November 11-December 11, 1950 (2,534 Crops of Which 2,326 Contained Food) | | | | November 11-December 11, 1951 (2,072 Crops of Which 1,845 Contained Food) | | | | Data From 1950 and 1951 Combined (4,606 Crops of Which 4,171 Contained Food) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Times Represented | Per Cent of Total Animal Food | Per Cent of Class | Per Cent of Order | Times Represented | Per Cent of Total Animal Food | Per Cent of Class | Per Cent of Order | Times Represented | Per Cent of Total Animal Food | Per Cent of Class | Per Cent of Order |
| SNAILS, SLUGS, LIMPETS, AND WHELKS (GASTROPODA) | 142 | 51.63 | | | 222 | 46.17 | | | 364 | 48.64 | | |
| Fresh water and land snails and slugs (Pulmonata) | 142 | | 100.00 | | 222 | | 100.00 | | 364 | | 100.00 | |
| Slugs (Philomycidae) | 134 | | | 95.42 | 181 | | | 96.38 | 315 | | | 95.92 |
| Slugs (Limacidae) | 8 | | | 4.58 | 6 | | | 1.88 | 14 | | | 3.18 |
| Amber Snails (Succinia) | — | | | — | 35 | | | 1.74 | 35 | | | 0.90 |
| INSECTS (INSECTA) | 600 | 43.18 | | | 927 | 45.69 | | | 1,527 | 44.56 | | |
| Grasshoppers, cockroaches, crickets (Orthoptera) | 141 | | 65.29 | | 99 | | 40.74 | | 240 | | 51.51 | |
| Short-horned grasshoppers (Acrididae) | 120 | | | 93.79 | 89 | | | 97.16 | 209 | | | 95.29 |
| Crickets (Gryllidae) | 10 | | | 3.64 | 6 | | | 1.88 | 16 | | | 2.86 |
| Cockroaches (Blattidae) | 5 | | | 1.00 | 2 | | | 0.50 | 7 | | | 0.78 |
| Long-horned grasshoppers (Tettigoniidae) | 4 | | | 0.75 | 2 | | | 0.47 | 6 | | | 0.62 |
| Orthoptera * | 2 | | | 0.82 | — | | | — | 2 | | | 0.46 |
| Insect Larvae * | 41 | | 7.30 | | 95 | | 14.54 | | 136 | | 11.36 | |
| Beetles (Coleoptera) | 151 | | 8.36 | | 250 | | 12.13 | | 401 | | 10.47 | |
| Ground beetles (Carabidae) | 66 | | | 58.17 | 138 | | | 74.45 | 204 | | | 68.75 |
| Leaf beetles (Chrysomelidae) | 12 | | | 3.67 | 48 | | | 10.53 | 60 | | | 8.13 |
| Snout beetles (Curculionidae) | 17 | | | 4.48 | 41 | | | 8.12 | 58 | | | 6.85 |
| Horned passalus (Passalidae) | 1 | | | 11.65 | — | | | — | 1 | | | 4.07 |
| Darkling beetles (Tenebrionidae) | 1 | | | 3.64 | 2 | | | 3.92 | 3 | | | 3.82 |
| Scarabs (Scarabaeidae) | 4 | | | 10.48 | — | | | — | 4 | | | 3.67 |
| Ladybird beetles (Coccinellidae) | 17 | | | 2.75 | 6 | | | 0.58 | 23 | | | 1.34 |
| Coleoptera * | 24 | | | 2.40 | 4 | | | 0.16 | 28 | | | 0.94 |
| Soldier beetle (Cantharidae) | — | | | — | 1 | | | 1.02 | 1 | | | 0.66 |
| Fungus-beetles (Erotylidae) | 6 | | | 1.53 | — | | | — | 6 | | | 0.53 |
| Primitive weevils (Brentidae) | 1 | | | 0.51 | 1 | | | 0.27 | 2 | | | 0.36 |
| Sap beetles (Nitidulidae) | 2 | | | 0.73 | — | | | — | 2 | | | 0.25 |
| Carpet beetle (Dermestidae) | — | | | — | 1 | | | 0.35 | 1 | | | 0.23 |
| Click beetles (Elateridae) | — | | | — | 5 | | | 0.25 | 5 | | | 0.16 |
| Rove beetles (Staphylinidae) | — | | | — | 2 | | | 0.24 | 2 | | | 0.15 |
| Bark beetle (Scolytidae) | — | | | — | 1 | | | 0.12 | 1 | | | 0.08 |
| True bugs (Heteroptera) | 39 | | 4.12 | | 175 | | 15.04 | | 214 | | 10.25 | |
| Stink bugs (Pentatomidae) | 26 | | | 94.83 | 80 | | | 81.89 | 106 | | | 84.18 |
| Squash bugs (Coreidae) | — | | | — | 5 | | | 6.64 | 5 | | | 5.47 |
| Pentatomid nymphs * | — | | | — | 22 | | | 3.79 | 22 | | | 3.12 |
| Assassin bugs (Reduviidae) | 4 | | | 2.36 | 21 | | | 3.16 | 25 | | | 3.02 |
| Negro bugs and burrower bugs (Cydnidae) | — | | | — | 16 | | | 2.39 | 16 | | | 1.97 |
| Leaf bugs (Miridae) | — | | | — | 24 | | | 1.24 | 24 | | | 1.02 |
| Heteroptera * | 9 | | | 2.80 | 3 | | | 0.09 | 12 | | | 0.57 |
| Shield-backed bug (Scutelleridae) | — | | | — | 1 | | | 0.66 | 1 | | | 0.55 |
| Chinch bugs (Lygaeidae) | — | | | — | 3 | | | 0.13 | 3 | | | 0.11 |
| Bees, wasps, ants (Hymenoptera) | 74 | | 6.57 | | 101 | | 9.66 | | 175 | | 8.31 | |
| Ants (Formicidae) | 72 | | | 97.78 | 100 | | | 98.53 | 172 | | | 98.27 |
| Typical wasp (Vespidae) | — | | | — | 1 | | | 1.47 | 1 | | | 0.96 |
| Hymenoptera * | 2 | | | 2.22 | — | | | — | 2 | | | 0.77 |
| Cicadas, leafhoppers, aphids, scales (Homoptera) | 75 | | 6.89 | | 104 | | 6.19 | | 179 | | 6.49 | |
| Leafhoppers (Cicadellidae) | 75 | | | 100.00 | 100 | | | 98.41 | 175 | | | 99.15 |
| Aphids (Aphidae) | — | | | — | 4 | | | 1.59 | 4 | | | 0.85 |

Table C.– Continued

| Animal Food Group | November 11-December 11, 1950 (2,534 Crops of Which 2,326 Contained Food) | | | | November 11-December 11, 1951 (2,072 Crops of Which 1,845 Contained Food) | | | | Data From 1950 and 1951 Combined (4,606 Crops of Which 4,171 Contained Food) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Times Represented | Per Cent of Total Animal Food | Per Cent of Class | Per Cent of Order | Times Represented | Per Cent of Total Animal Food | Per Cent of Class | Per Cent of Order | Times Represented | Per Cent of Total Animal Food | Per Cent of Class | Per Cent of Order |
| Plant galls * | 1 | | – | | 9 | | 1.01 | | 9 | | 0.57 | |
| Insect parts * | 70 | | 0.63 | | 84 | | 0.47 | | 154 | | 0.54 | |
| Moths, skippers, butterflies (Lepidoptera) | 2 | | 0.61 | | – | | – | | 2 | | 0.27 | |
| Flies (Diptera) | 3 | | 0.12 | | 6 | | 0.15 | | 9 | | 0.14 | |
| House flies (Muscidae) | 2 | | | 63.41 | 2 | | | 40.00 | 4 | | | 49.06 |
| Flesh flies (Sarcophagidae) | 1 | | | 36.59 | 1 | | | 23.08 | 2 | | | 28.30 |
| Diptera * | – | | | – | 3 | | | 36.92 | 3 | | | 22.64 |
| Insect pupae * | 4 | | 0.10 | | 4 | | 0.08 | | 8 | | 0.09 | |
| SCORPIONS, HARVESTMEN, SPIDERS, MITES (ARACHNOIDEA) | 59 | 3.29 | | | 99 | 4.97 | | | 158 | 4.21 | | |
| Spiders (Araneae) | 56 | | 95.69 | | 95 | | 96.06 | | 151 | | 95.93 | |
| Arachnida * | 3 | | 4.31 | | 3 | | 3.93 | | 6 | | 4.06 | |
| Spider egg (Araneae) | – | | – | | 1 | | 0.01 | | 1 | | 0.01 | |
| CENTIPEDES (CHILOPODA) | 4 | 1.37 | | | 9 | 1.98 | | | 13 | 1.70 | | |
| MILLIPEDES (DIPLOPODA) | 4 | 0.53 | | | 9 | 1.19 | | | 13 | 0.89 | | |

* Food item not identified further than category given.

Table D. — For each of 187 separate designations of food, the percentage of bobwhite crops containing that food and the percentage of the total volume of crop contents comprised by that food in bobwhite crops collected in southern Illinois during the hunting seasons of 1950 and 1951 and for the same crops in the two hunting seasons combined; the food items are listed in descending order of rank by per cent of total volume of crop contents.

| Food Item | 1950 | | 1951 | | 1950 and 1951 | |
|---|---|---|---|---|---|---|
| | Per Cent of Total Occurrences | Per Cent of Volume | Per Cent of Total Occurrences | Per Cent of Volume | Per Cent of Total Occurrences | Per Cent of Volume |
| Corn | 31.25 | 30.78 | 25.92 | 23.74 | 28.85 | 27.79 |
| Soybean | 26.20 | 29.05 | 17.04 | 13.47 | 22.08 | 22.43 |
| Korean and Japanese lespedezas | 44.44 | 9.89 | 39.50 | 7.00 | 42.23 | 8.66 |
| Oak (acorns) | 6.27 | 4.62 | 13.56 | 10.66 | 9.55 | 7.19 |
| Wheat | 2.57 | 2.54 | 6.95 | 9.38 | 4.54 | 5.45 |
| Common ragweed | 28.26 | 4.65 | 25.13 | 4.50 | 26.40 | 4.58 |
| White sassafras | 0.75 | 0.36 | 10.71 | 8.44 | 5.23 | 3.80 |
| Desmodium | 7.18 | 0.91 | 18.15 | 5.69 | 12.11 | 2.94 |
| Slugs (Philomycidae) | 5.29 | 2.34 | 8.74 | 3.46 | 6.84 | 2.81 |
| Jewelweed | 9.35 | 2.00 | 7.82 | 1.58 | 8.66 | 1.82 |
| Bidens | 17.25 | 1.09 | 21.09 | 1.78 | 18.98 | 1.38 |
| Cowpea | 2.53 | 2.06 | 0.77 | 0.39 | 1.73 | 1.36 |
| Short-horned grasshoppers | 4.74 | 1.25 | 4.30 | 1.41 | 4.54 | 1.32 |
| Small wild bean | 10.73 | 1.05 | 14.33 | 0.94 | 12.35 | 1.00 |
| Yellow foxtail | 12.51 | 1.21 | 4.97 | 0.38 | 9.12 | 0.86 |
| Smooth crabgrass | 15.07 | 1.00 | 9.65 | 0.43 | 12.64 | 0.76 |
| Lance-leaved ragweed | 2.37 | 0.23 | 4.92 | 0.73 | 3.52 | 0.44 |
| Black gum | 0.59 | 0.77 | — | — | 0.33 | 0.44 |
| Insect larvae, unidentified | 1.62 | 0.15 | 4.58 | 0.52 | 2.95 | 0.31 |
| Smooth sumac | 1.14 | 0.09 | 4.25 | 0.48 | 2.54 | 0.26 |
| Spiders | 2.21 | 0.15 | 4.58 | 0.37 | 3.28 | 0.24 |
| Stink bugs | 1.03 | 0.08 | 3.86 | 0.44 | 2.30 | 0.23 |
| Ants | 2.84 | 0.13 | 4.83 | 0.34 | 3.73 | 0.22 |
| Rushfoil | 2.01 | 0.35 | 1.25 | 0.03 | 1.67 | 0.21 |
| Hogwort | 1.18 | 0.31 | 0.39 | 0.06 | 0.83 | 0.20 |
| Ground beetles | 2.60 | 0.10 | 6.66 | 0.32 | 4.43 | 0.19 |
| Hog peanut | 0.32 | 0.04 | 2.70 | 0.39 | 1.39 | 0.19 |
| Leafhoppers | 2.96 | 0.14 | 4.83 | 0.22 | 3.80 | 0.17 |
| Poison ivy | 2.05 | 0.21 | 0.97 | 0.12 | 1.56 | 0.17 |
| Sweet gum | 1.38 | 0.21 | 0.68 | 0.06 | 1.06 | 0.15 |
| Switchgrass | 0.16 | trace | 8.30 | 0.29 | 3.82 | 0.13 |
| Fall panicum | 4.54 | 0.20 | 1.21 | 0.01 | 3.04 | 0.12 |
| Black locust | 0.51 | 0.12 | 0.82 | 0.09 | 0.65 | 0.11 |
| Osage orange | 0.39 | 0.10 | 0.82 | 0.12 | 0.59 | 0.11 |
| Centipedes | 0.16 | 0.06 | 0.43 | 0.15 | 0.28 | 0.10 |
| Faber's foxtail | — | — | 2.46 | 0.21 | 1.11 | 0.09 |
| Slugs (Limacidae) | 0.32 | 0.11 | 0.29 | 0.07 | 0.30 | 0.09 |
| Horse nettle | 1.89 | 0.11 | 0.72 | 0.04 | 1.37 | 0.08 |
| Oats | — | — | 0.10 | 0.19 | 0.04 | 0.08 |
| Climbing false buckwheat | 1.74 | 0.09 | 1.06 | 0.04 | 1.43 | 0.07 |
| Great ragweed | 0.91 | 0.08 | 1.16 | 0.06 | 1.02 | 0.07 |
| Grapes* | 0.83 | 0.11 | 0.48 | 0.02 | 0.67 | 0.07 |
| Partridge pea | 1.50 | 0.04 | 3.47 | 0.08 | 2.39 | 0.06 |
| Paspalums* | 4.10 | 0.10 | — | — | 2.26 | 0.06 |
| Sumacs* | 0.43 | 0.05 | 1.64 | 0.09 | 0.98 | 0.06 |
| Witch grass | 10.30 | 0.08 | 2.41 | 0.01 | 6.75 | 0.05 |
| Common crabgrass | 4.70 | 0.08 | 2.03 | 0.02 | 3.52 | 0.05 |
| Trailing wild bean | 0.12 | 0.04 | 0.82 | 0.07 | 0.43 | 0.05 |
| Millipedes | 0.16 | 0.02 | 0.43 | 0.09 | 0.28 | 0.05 |
| Rough buttonweed | 1.22 | 0.07 | 0.82 | 0.01 | 1.04 | 0.04 |
| Dayflower | 0.87 | 0.07 | — | — | 0.48 | 0.04 |

*Some species of this genus were identified and the data for those are given under the individual common names; this category includes only that plant material which could not be identified as to species.

Table D. — Continued

| Food Item | 1950 | | 1951 | | 1950 and 1951 | |
|---|---|---|---|---|---|---|
| | Per Cent of Total Occurrences | Per Cent of Volume | Per Cent of Total Occurrences | Per Cent of Volume | Per Cent of Total Occurrences | Per Cent of Volume |
| Crickets | 0.39 | 0.05 | 0.29 | 0.03 | 0.35 | 0.04 |
| Pennsylvania smartweed | 4.03 | 0.04 | 2.27 | 0.02 | 3.23 | 0.03 |
| Common smartweed | 1.82 | 0.05 | 1.21 | 0.01 | 1.54 | 0.03 |
| Amber snails | — | — | 1.69 | 0.06 | 0.76 | 0.03 |
| Purple meadow rue | 0.24 | 0.04 | — | — | 0.13 | 0.03 |
| Field paspalum | — | — | 3.14 | 0.05 | 1.41 | 0.02 |
| Leaf beetles | 0.47 | 0.01 | 2.32 | 0.05 | 1.30 | 0.02 |
| Snout beetles | 0.67 | 0.01 | 1.98 | 0.03 | 1.26 | 0.02 |
| Wild sensitive plant | 1.10 | 0.02 | 0.87 | 0.01 | 1.00 | 0.02 |
| White avens | 1.22 | 0.03 | 0.53 | trace | 0.91 | 0.02 |
| Green foxtail | 1.03 | 0.01 | 0.53 | 0.03 | 0.80 | 0.02 |
| Japanese honeysuckle | 0.91 | 0.03 | — | — | 0.50 | 0.02 |
| Sand croton | 0.32 | 0.03 | 0.58 | 0.02 | 0.43 | 0.02 |
| Prairie tea | 0.28 | 0.02 | 0.53 | 0.02 | 0.39 | 0.02 |
| Finger grass | 0.47 | 0.03 | 0.05 | trace | 0.28 | 0.02 |
| Plant galls, unidentified | — | — | 0.43 | 0.04 | 0.20 | 0.02 |
| Squash bugs | — | — | 0.24 | 0.04 | 0.11 | 0.02 |
| Shrubby perilla | — | — | 0.19 | 0.04 | 0.09 | 0.02 |
| Plums* | 0.08 | trace | 0.05 | 0.05 | 0.07 | 0.02 |
| Plant material, unidentified | 8.17 | 0.01 | 1.48 | 0.01 | 5.15 | 0.01 |
| Insect parts, unidentified | 2.76 | 0.01 | 4.05 | 0.02 | 3.34 | 0.01 |
| Leaf material, unidentified | 0.63 | trace | 3.19 | 0.03 | 1.78 | 0.01 |
| Bush clover | 0.63 | 0.01 | 1.40 | 0.01 | 0.98 | 0.01 |
| Prickly mallow | 1.14 | 0.01 | 0.53 | trace | 0.87 | 0.01 |
| Three-seeded mercury | 0.16 | trace | 1.59 | 0.03 | 0.80 | 0.01 |
| Ciliate-leaved paspalum | — | — | 1.45 | 0.02 | 0.65 | 0.01 |
| Ashes | — | — | 1.45 | 0.03 | 0.65 | 0.01 |
| Assassin bugs | 0.16 | trace | 1.01 | 0.02 | 0.54 | 0.01 |
| Pentatomid nymphs† | — | — | 1.06 | 0.02 | 0.48 | 0.01 |
| Milkweeds | 0.36 | 0.01 | 0.53 | 0.01 | 0.43 | 0.01 |
| Coralberry | 0.55 | 0.01 | 0.29 | trace | 0.43 | 0.01 |
| Cheat | 0.47 | 0.02 | 0.29 | trace | 0.39 | 0.01 |
| Negro bugs and burrower bugs | — | — | 0.77 | 0.01 | 0.35 | 0.01 |
| Italian millet | 0.32 | 0.01 | 0.34 | 0.01 | 0.33 | 0.01 |
| Spurges* | — | — | 0.72 | 0.02 | 0.33 | 0.01 |
| Fox grape | — | — | 0.48 | 0.02 | 0.22 | 0.01 |
| Winter grape | — | — | 0.43 | 0.03 | 0.20 | 0.01 |
| Red osier dogwood | 0.12 | 0.01 | 0.29 | trace | 0.20 | 0.01 |
| Violets | — | — | 0.39 | 0.01 | 0.17 | 0.01 |
| Cockroaches | 0.20 | 0.01 | 0.10 | 0.01 | 0.15 | 0.01 |
| Long-horned grasshoppers | 0.16 | 0.01 | 0.10 | 0.01 | 0.13 | 0.01 |
| Arachnida† | 0.12 | 0.01 | 0.14 | 0.02 | 0.13 | 0.01 |
| Rye | 0.12 | 0.01 | 0.05 | 0.01 | 0.09 | 0.01 |
| Scarabs | 0.16 | 0.02 | — | — | 0.09 | 0.01 |
| Bicolor bush clover | — | — | 0.19 | 0.01 | 0.09 | 0.01 |
| Darkling beetles | 0.04 | 0.01 | 0.10 | 0.02 | 0.07 | 0.01 |
| Johnson grass | 0.04 | trace | 0.10 | 0.01 | 0.07 | 0.01 |
| Orthoptera† | 0.08 | 0.01 | — | — | 0.04 | 0.01 |
| Moths, skippers, and butterflies | 0.08 | 0.01 | — | — | 0.04 | 0.01 |
| Horned passalus | 0.04 | 0.02 | — | — | 0.02 | 0.01 |
| Wood sorrel | 2.29 | 0.01 | 1.06 | trace | 1.74 | trace |
| Pigweed | 1.38 | trace | 0.92 | trace | 1.17 | trace |

*Some species of this genus were identified and the data for those are given under the individual common names; this category includes only that plant material which could not be identified as to species.

†Some families of this order were identified and the data for those are given under the individual common names; this category includes only that animal material which could not be identified as to family.

Table D. – Continued

| Food Item | 1950 | | 1951 | | 1950 and 1951 | |
|---|---|---|---|---|---|---|
| | Per Cent of Total Occurrences | Per Cent of Volume | Per Cent of Total Occurrences | Per Cent of Volume | Per Cent of Total Occurrences | Per Cent of Volume |
| Lamb's quarter | 1.26 | trace | 0.53 | trace | 0.93 | trace |
| Black nightshade | 0.87 | trace | 0.68 | trace | 0.78 | trace |
| Animal material, unidentified | 1.10 | trace | 0.24 | trace | 0.72 | trace |
| Paspalum | — | — | 1.50 | 0.01 | 0.67 | trace |
| Coleoptera† | 0.95 | trace | 0.19 | trace | 0.61 | trace |
| Leaf bugs | — | — | 1.16 | 0.01 | 0.52 | trace |
| Ladybird beetles | 0.67 | trace | 0.29 | trace | 0.50 | trace |
| Scorpion grass | 0.39 | trace | 0.43 | trace | 0.41 | trace |
| Brambles | 0.51 | 0.01 | 0.05 | trace | 0.30 | trace |
| Heteroptera† | 0.26 | trace | 0.14 | trace | 0.26 | trace |
| Field thistle | 0.12 | trace | 0.43 | trace | 0.26 | trace |
| Field sorrel | 0.36 | trace | — | — | 0.20 | trace |
| Panic grasses* | — | — | 0.39 | trace | 0.17 | trace |
| Sedge | 0.12 | trace | 0.24 | trace | 0.17 | trace |
| Insect pupae, unidentified | 0.16 | trace | 0.19 | trace | 0.17 | trace |
| Curly dock | 0.32 | trace | — | — | 0.17 | trace |
| Sunflowers | 0.08 | trace | 0.29 | trace | 0.17 | trace |
| Beaked panic grass | — | — | 0.34 | trace | 0.15 | trace |
| Pink wild bean | — | — | 0.34 | 0.01 | 0.15 | trace |
| Carpetweed | — | — | 0.34 | trace | 0.15 | trace |
| Fungus-beetles | 0.24 | trace | — | — | 0.13 | trace |
| Broom sedge | 0.20 | trace | 0.05 | trace | 0.13 | trace |
| Meadow grasses | 0.08 | trace | 0.14 | trace | 0.11 | trace |
| Click beetles | — | — | 0.24 | trace | 0.11 | trace |
| Velvetleaf | 0.08 | trace | 0.14 | trace | 0.11 | trace |
| Trumpet creeper | — | — | 0.24 | trace | 0.11 | trace |
| Barnyard grass | 0.04 | trace | 0.14 | trace | 0.09 | trace |
| Aphids | — | — | 0.19 | trace | 0.09 | trace |
| Pale dock | 0.16 | trace | — | — | 0.09 | trace |
| House flies | 0.08 | trace | 0.10 | trace | 0.09 | trace |
| Wild black cherry | — | — | 0.19 | 0.01 | 0.09 | trace |
| Red clover | 0.08 | trace | 0.10 | trace | 0.09 | trace |
| Roses | 0.12 | trace | — | — | 0.07 | trace |
| Chinch bugs | — | — | 0.14 | trace | 0.07 | trace |
| Frost grape | — | — | 0.14 | trace | 0.07 | trace |
| Diptera† | — | — | 0.14 | trace | 0.07 | trace |
| Field bindweed | 0.12 | 0.01 | — | — | 0.07 | trace |
| Heal-all | 0.12 | trace | — | — | 0.07 | trace |
| Red cedar | 0.08 | trace | — | — | 0.04 | trace |
| Sap beetles | 0.08 | trace | — | — | 0.04 | trace |
| Wild ryes | 0.08 | trace | — | — | 0.04 | trace |
| Primitive weevils | 0.04 | trace | 0.05 | trace | 0.04 | trace |
| Timothy | 0.08 | trace | — | — | 0.04 | trace |
| Rove beetles | — | — | 0.10 | trace | 0.04 | trace |
| Crabgrasses* | 0.08 | trace | — | — | 0.04 | trace |
| Flesh flies | 0.04 | trace | 0.05 | trace | 0.04 | trace |
| Little barley | — | — | 0.10 | trace | 0.04 | trace |
| Hymenoptera† | 0.08 | trace | — | — | 0.04 | trace |
| Crimson clover | 0.08 | trace | — | — | 0.04 | trace |
| Vetch | 0.08 | trace | — | — | 0.04 | trace |
| Common elder | 0.08 | trace | — | — | 0.04 | trace |
| Crownbeard | 0.08 | trace | — | — | 0.04 | trace |

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†Some families of this order were identified and the data for those are given under the individual common names; this category includes only that animal material which could not be identified as to family.

Table D. — Continued

| Food Item | 1950 | | 1951 | | 1950 and 1951 | |
|---|---|---|---|---|---|---|
| | Per Cent of Total Occurrences | Per Cent of Volume | Per Cent of Total Occurrences | Per Cent of Volume | Per Cent of Total Occurrences | Per Cent of Volume |
| Sumpweed | 0.08 | trace | — | — | 0.04 | trace |
| Blue vervain | — | — | 0.10 | trace | 0.04 | trace |
| Common juniper | 0.04 | trace | — | — | 0.02 | trace |
| Bark beetle | — | — | 0.05 | trace | 0.02 | trace |
| Orchard grass | 0.04 | trace | — | — | 0.02 | trace |
| Carpet beetle | — | — | 0.05 | trace | 0.02 | trace |
| Few-flowered panic grass | — | — | 0.05 | trace | 0.02 | trace |
| Rice cutgrass | — | — | 0.05 | trace | 0.02 | trace |
| Umbrella sedge | 0.04 | trace | — | — | 0.02 | trace |
| Soldier beetle | — | — | 0.05 | trace | 0.02 | trace |
| Shield-backed bugs | — | — | 0.05 | trace | 0.02 | trace |
| Blunt spike rush | 0.04 | trace | — | — | 0.02 | trace |
| Greenbrier | 0.04 | trace | — | — | 0.02 | trace |
| Typical wasp | — | — | 0.05 | 0.01 | 0.02 | trace |
| Nettle | 0.04 | trace | — | — | 0.02 | trace |
| Smartweed | 0.04 | trace | — | — | 0.02 | trace |
| Spider egg | — | — | 0.05 | trace | 0.02 | trace |
| Pokeweed | 0.04 | trace | — | — | 0.02 | trace |
| Common chickweed | 0.04 | trace | — | — | 0.02 | trace |
| Mustard | 0.04 | trace | — | — | 0.02 | trace |
| Wild sweet crabapple | — | — | 0.05 | trace | 0.02 | trace |
| Virginian bush clover | — | — | 0.05 | trace | 0.02 | trace |
| Wild senna | — | — | 0.05 | trace | 0.02 | trace |
| Prairie trefoil | 0.04 | trace | — | — | 0.02 | trace |
| Sweet clover | 0.04 | trace | — | — | 0.02 | trace |
| Cranesbill | 0.04 | trace | — | — | 0.02 | trace |
| Spurge | — | — | 0.05 | trace | 0.02 | trace |
| Flowering dogwood | 0.04 | trace | — | — | 0.02 | trace |
| Ground cherry | 0.04 | trace | — | — | 0.02 | trace |
| Pursh's plantain | 0.04 | trace | — | — | 0.02 | trace |
| Climbing bittersweet | — | — | 0.05 | trace | 0.02 | trace |
| Large-fruited snakeroot | — | — | 0.05 | trace | 0.02 | trace |